A Comprehensive Review of Detoxifying plants

Sreelakshmi K. P.*[1], Fousiya K[2], Merlin A John[3]

*[1]Assistant Professor, Department of Pharmacognosy and Phytochemistry, Nehru College of Pharmacy, Pampady Thiruvilwamala, Thrissur, Kerala.

[2,3]Student, Department of Pharmacognosy and Phytochemistry, Nehru College of Pharmacy, Pampady Thiruvilwamala, Thrissur, Kerala.

Abstract:

Toxic chemicals are eliminated from organisms by detoxifying agents. They can be employed to reduce the toxicity of mycotoxins, repair organ damage, or shield organs during chemotherapy.

The process of detoxifying is quite important. Indeed, maintaining general health is aided by efficiently neutralizing and getting rid of pollutants. The most effective medicinal plants' ancient and contemporary uses, their active metabolites as detoxifying agents, the processes and pathways involved in the detoxification process, and the detoxification process itself are all included in this review.

Keywords: Giloy, Milk Thistle, Blueberry, Green tea, Liquorice, Cardamom

INTRODUCTION

The body's natural process of neutralizing or getting rid of poisons is called detoxification. This is primarily carried out by organs like the liver and kidneys. Plants containing compounds that can be used to treat or prevent diseases and promote overall well-being. Many medicinal plants possess properties that can support the body’s natural detoxification pathways. Traditional medicine systems like Ayurveda, Traditional Chinese medicines, and Indigenous healing practices have long utilized plants for cleansing and purification [1]. A number of diseases including obesity, diabetes, cardiovascular diseases, CNS disorders and others may develop or worsen as a result of improper clearance and subsequent accumulation of toxins overtime. Silymarin and silybin are the principle active constituents present in numerous detoxifying plants. Silymarin has demonstrated the ability to enhance glutathione levels in people and safeguard the membranes of liver cells by strengthening the body’s innate defenses [2]. Here we are going to review some herbs that help in detoxification. The

plant includes Blueberries, Green tea, Cardamom, Liquorice, Giloy, and Milk thistle. This review includes chemical constituents, synonyms and action of these plants.

1.*Vaccinium myrtillus L.*

Figure 1: ***Vaccinium myrtillus L.***

Synonyms:

English: bilberry, wimberry, whortleberry, and huckleberry.

Tamil: Avirunelli [3]

Biological source:

Vaccinium myrtillus L. (bilberry) is a shrub which belongs to the family Ericaceae and genus Vaccinium and its habitat is mountainous regions in Europe, Asia, and North America.

Family: Ericaceae [4]

Chemical constituents:

Vaccinium myrtillus L. contains certain chemical constituents which include:

- Blueberries in a fresh form consist of water (84%), carbohydrates (9.7%), proteins (0.6%) and fat (0.4%) and so on.
- The total content of polyphenols in blueberries ranges from 48 up to 304 mg/100 g of fresh fruit weight (up to 0.3%).

- Flavonoids, procyanidins (monomeric and oligomeric form), flavanols (i.e., kaempferol, quercetin, myricetin) phenolic acids (mainly hydroxycinnamic acids) and derivatives of stilbenes.
- The anthocyanin content has been found to range from 25 up to 495 mg/100 g of blueberries, and it depends on fruit size, ripening stage, as well as on climatic, pre-harvest environmental conditions and storage.
- The percentage of delphinidin is 27%–40%, malvidin 22%–33%, petunidin 19%–26%, cyanidin 6%–14% and peonidin 1%–5% [5].

Detoxifying Action:

Blueberries help to combat the effects of oxidative stress that cause chronic diseases like diabetes, heart disease, and some types of cancer [2]. Vitamin C is known to be highly affected by a variety of environmental factors including oxygen, pH, light, temperature and moisture content. If the skin was damaged, the ascorbic acid was released and could be oxidized, and the concentration in the fruit significantly reduced. The freeze-dried blueberry sample revealed a low amount of ascorbic acid when compared to the dried sample. This might be because of significant loss of vitamin C during postharvest handling, processing, and storage conditions [6].

2. Camella sinesis

Figure 2: ***Camella sinesis***

Synonyms:

English: Leaf tea

Japanese: Matcha, Bancha, Oolong tea [7]

Biological source:

Green tea, from the plant *Camellia sinensis*, is consumed in different parts of the world such as China, Taiwan, Japan and so on. It belongs to the family Theaceae [7]. The most popular one of green tea consumed is Sencha, most often made in Japan.

Family: Theaceae [7,8]

Chemical constituents:

- Green tea has a protein content of about 15–20%, which include amino acids such as l-theanine, tyrosine, tryptophan, threonine, 5-N-ethylglutamine, glutamic acid, serine, glycine, valine, leucine, aspartic acid, lysine and arginine.
- The trace elements such as magnesium, chromium, manganese, calcium, copper, zinc, iron, selenium, sodium cobalt or nickel, and carbohydrates such as glucose, cellulose and sucrose [7].
- Vitamins B2, B3, and C, as well as sterols and lipids like linoleic and α-linolenic acid, are abundant in green tea.
- The antioxidant potential of catechins with a pyrogalol group is higher than that of catechins with a catechol group.
- Catechins such as epicatechin, Epigallocatechin, Epicatechin-3-gallate, Eppigallocatechin-3- gallate [8].

Detoxifying Action:

It is a common nutraceutical which contains antioxidants which detoxifies the body. Antioxidants are substances that shield cells from the harmful effects of reactive oxygen species, including peroxyl radicals, hydroxyl radicals, superoxide, singlet oxygen, and peroxynitrite. An Imbalance between the antioxidants and the reactive oxygen results in oxidative stress, which leads to cellular damage. Catechins help to protect against diseases by contributing, along with antioxidant vitamins i,e vitamin C and E and enzymes which contributes to total antioxidant defense system.[8]

3. *Elettaria cardamomum*

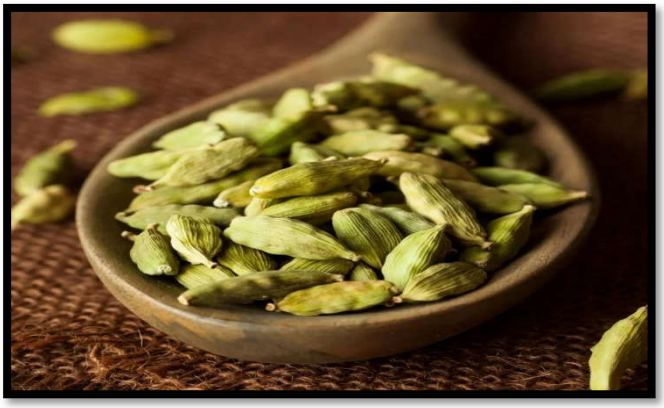

Figure3*: Elettaria cardamomum*

Synonyms:

English; Green cardamom, true cardamom.

Malayalam: Elam [9]

Biological source:

The *Elettaria cardamomum* genera belonging to the Zingiberaceae family is native to South India to West Malaysia. It is mostly grown in Kerala's Indian Cardamom Hills, which are classified as Cardamom Hill Reserves. The name *Elettaria cardamomum* was originated from the Tamil word "Elettari" [9].

Family: Zingiberaceae [10].

Chemical constituents:

- Alkaloids, anthraquinones, cardiac glycosides, saponins, tannins and polyphenols are present
- The seed contains phytochemical compounds such as phenols, starch, tannins, terpinoids, flavonoids, proteins and sterols [11].
- 1, 8-cineole (28.94%), α terpinyl acetate (26.7%), α-terpineol (14.6%), sabinene (13.5%), nerol (5.0%) and α-pinene (2.4%) 37 α-terpinyl acetate, 1, 8-cineole and αterpineol 38 α-terpinyl acetate, 1, 8-cineole, sabinene, linalyl acetate, linalyl acetate, linalool.

- Limonene (2.9%), 4-terpineol (1.4%), α-pinene (1.1%), βpinene (0.8%), myrcene (0.8%), octanal (0.2%), δ3-carene (0.4%), p-cymene (0.7%), (E)- nerolidol (0.7%) cis-sabinene hydrate (0.6%), geranylacetate (0.3%), cis-sabinene hydrate acetate (0.2%), β-caryophyllene (0.2%), β-selinene (0.2%), γ-cadinene (0.2%), translinalooloxide (0.1%) 40 α-tocopherol, γ-tocopherol, δ-tocopherol, oleic acid, palmitic acid, linoleic acid[12].

Detoxifying Action:

Antioxidant activities are related to oxygenated monoterpenes and phenyl prostanoids [13].

Phenols, starch, tannins, terpenoids, flavonoids, proteins, sterols, anthocyanins, and alkaloids are the major constituents responsible for the detoxification [14].

4. *Glycyrrhiza glabra*

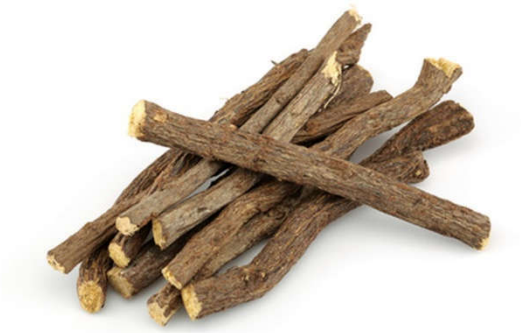

Figure 4: *Glycyrrhiza glabra* [15]

Synonyms:

English: Liquorice, Licorice, Sweet wood, Glycyrrhiza

Hindi: Mulethi

Sanskrit: Yashtimadhu, Madhuka

Turkish: Meyan or beyan [16]

Biological source:

Liquorize obtained from the plant of *Glycyrrhiza glabra*

Family: Fabaceae

This perennial shrub is native to Asia and Europe and is widely used in traditional herbal medicine. It is also present in southern Italy, China, Spain, France, Greece, Germany, India, Russia, US, etc. [17]

Chemical constituents:

The major constituent of liquorice is glycyrrhizin, a saponin which is more sweeter than sugar cane and a glycyrrhetinic acid. It also contains flavonoids like liquirtin, isoliquertin, liquiritigenin, and rhamnoliquirilin. Volatile components such as pentanol, hexanol, linalool oxide A and B, α-terpeneol, and geraniol are also present. Asparagine is also found in the root of liquorice. [18]

Detoxifying action:

Liquorice has been shown to have a variety of pharmacological properties, including hepatoprotective, anti-inflammatory, and anti-cancer benefits. [19]

The active components, such as pentacyclic triterpene saponin (glycyrrhetinic acid) and flavonoids (liquiritin, liquiritigenin, isoliquiritin, isoliquiritigenin, and licochalcone A), were able to increase the expression of efflux transporters, such as P-gp, BCRP, and MRP2, which results in decreased absorption of xenobiotics across the small intestinal membrane. [20]

One of the most important classes of phytotoxins found in a variety of plant species are pyrrolizidine alkaloids (PAs). When used into herbal formulae, *Glycyrrhiza glabra* can both lessen the toxicities of some herbs and balance out their unpleasant characteristics. Glycyrrhizin and glycyrrhetinic acid, two active ingredients, counteract the harmful effects of PAs and repair any possible liver damage they may have produced. Since cytochrome P isoforms are in charge of the metabolic activation of PAs, glycyrrhetinic acid has been shown to have the capacity to suppress their activity. [21]

5. *Tinospora cordifolia*

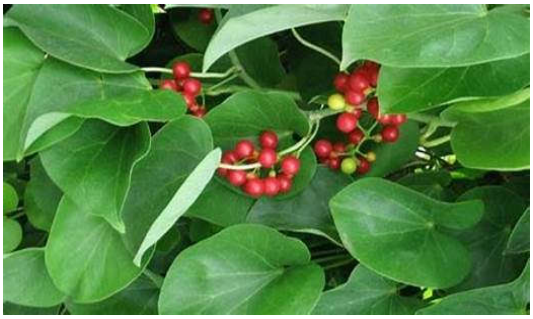

Figure 4: *Tinospora cordifolia* [22]

Synonyms:

India: Guduchi, Amrita

English: Tinospora, Indian Tinospora

Hindi: Giloya

Sanskrit: Amritha

Sinhala: Rasakinda [23]

Biological source:

Tinospora cordifolia is a large deciduous climbing shrub belonging to the Menispermaceae family. [23]

It is established throughout the India & also in parts of Sri Lanka, Bangladesh and China. [24]

Chemical constituents:

Alkaloids**:** Berberine, palmatine, jatrorrhizine, magnoflorine, choline and tembetarine.

Glycoside: Syringin, cardifolioside A, and tinocordiside

Diterpenoids: Furanolactone, tinosporon, and tinosporides

Steroids: β-sitosterol and ecdysterone

Aliphatic compound: Octacosanol and heptacosanol

Sesquiterpenoids: Tinocordifolin

Essential oil: Hydroquinone, 2-hexenal, palmitic acid and phytol

Polysaccharide: Glucose, arabinose, rhamnose, xylose, mannose and galactose [25, 26]

Detoxifying action:

Giloy has an immune-boosting effect. It is said to have antipyretic, anti-allergic, and anti-inflammatory qualities. Additionally, Tinospora cordifolia exhibits hepatoprotective, antimicrobial, antiosteoporotic, anti-obesity, anticarcinogenic, antimutagenic, hypolipidemic, and hypoglycaemic properties. Giloy's antioxidant properties aid in skin detoxification. Giloy is also used to treat urinary tract infections, liver, and renal issues. [27]It is also reported to have anti-stress, wound healing and anti-HIV activities. [28]

6. *Silybum marianum*

Figure 6: *Silybum marianum* [29]

Synonyms:

English: Blessed milk thistle, thistle, Lady’s thistle, Holy thistle, St. Mary’s thistle

Germany: Mariendistel, Gemeine mariendistel

French: Chardon argente, Chardon marie

Russian: Ostropestro

Swedish: Sempertin

Spanish: Cardo asnal, cardo blanco

Romanian: Armurariu

Netherland: Mariadistel

Dutch: Mariendistel, Vrouwendistel [30]

Biological source:

It is obtained from the herbaceous plant of *Silybum marianum* which belongs to the family Asteraceae. The plant is native to Bulgaria, Egypt, Asia, North America, Africa, and Europe. [31]

Chemical constituents:

Flavonolignans: Silymarin including silybins A and B, isosilybins A and B, silychristin A, isosilychristin, and silydianin

Flavanoids: Taxifoline, quercetine, dihydrokaempferol, kaempferol, apigenin, naringin, eriodyctiol, and chrysoeriol

Sugars: Arabinose, rhamnose, xylose, glucose

Sterols: Cholesterol, campesterol, stigmasterol, and sitosterol

Lipids: Linoleic acid, oleic acid, and palmitic acid

Others: Proteins, tocopherol[30, 32]

Detoxifying action:

By raising the amount of glutathione in the liver, silymarin has been demonstrated to treat and prevent a number of liver disorders. Glutathione aids in the detoxification of medicines, carcinogens, and xenobiotics since it is involved in the liver's phase I and phase II detoxification processes. Silymarin helps repair liver cells damaged by alcohol, different microorganisms, and other harmful substances, while silibinin promotes the liver's ability to regenerate. [33, 34]

It is also reported to have anti-cancer, hepatoproective, renal protective, immunomodulatory, anti-inflammatory, and neuroprotective activities. [33]

CONCLUSION

The review highlights that many medicinal plants support the body's natural detoxification systems. These compounds not only help in eliminating toxins but also play a role in preventing diseases by reducing oxidative stress and supporting organ health. Traditional

medicine systems, including Ayurveda and Chinese medicine, have long recognized these detoxifying plants, and modern research continues to support their therapeutic potential. Incorporating detoxifying plants into the diet and daily routine provides a natural and effective way to maintain long-term wellbeing.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

ACKNOWLEDGEMENT

The authors acknowledging Nehru College of Pharmacy, Pampady, Thiruvilwamala, Thrissur, Kerala for providing all the support.

REFERENCES

1. Geir Bjørklund, Natália Cruz-Martins, Bey Hing Goh, Olha Mykhailenko, Lysiuk R, Mariia Shanaida, et al. Medicinal Plant-Derived Phytochemicals in Detoxification. Current Pharmaceutical Design. 2023 Aug 9;29.

2. El-Khodor BF, Zang W, Gorby H, Dominique A, Hamrock M, Metzer B, Pecorelli A, Varadharaj S, Valacchi G. A Plant-Based Dietary Supplement Improves Measures of Metabolic Detoxification and the Quality of Life: A Phase II Multicenter Randomized, Blinded, Pla Bibliography

3. BLUEBERRIES AND CRANBERRIES (VACCINIUM) [Internet]. Actahort.org. 2025 [cited 2025 Mar 4]. Available from: https://www.actahort.org/books/290/290_9.htm cebo-Controlled Clinical Trial. Integr Med (Encinitas). 2023 Nov;22(5):28-39.
4. Elferjane M, Milutinović V, Jovanović Krivokuća M, Taherzadeh M, Pietrzak W, Marinković A, et al. Vaccinium myrtillus L. Leaf Waste as a Source of Biologically Potent Compounds: Optimization of Polyphenol Extractions, Chemical Profile, and Biological Properties of the Extracts. Pharmaceutics. 2024 May 30;16(6):740.
5. Michalska A, Łysiak G. Bioactive Compounds of Blueberries: Post-Harvest Factors Influencing the Nutritional Value of Products. International Journal of Molecular Sciences. 2015 Aug 10;16(8):18642–63.
6. Al Hasani S, Al-Attabi ZH, Waly M, Rahman MS, Tamimi Y. Antioxidant and Antitumor Properties of Wild Blueberry (Sideroxylon mascatense). International Journal of Nutrition, Pharmacology, Neurological Diseases. 2021 Jan;11(1):71–9.
7. Musial C, Kuban-Jankowska A, Gorska-Ponikowska M. Beneficial Properties of Green Tea Catechins. International Journal of Molecular Sciences [Internet]. 2020 Mar 4;21(5):1744. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7084675
8. Chacko SM, Thambi PT, Kuttan R, Nishigaki I. Beneficial Effects of Green tea: a Literature Review. Chinese Medicine [Internet]. 2010 Apr 6;5(1):13. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2855614/
9. Kumar S, Kumari R. TRADITIONAL, PHYTOCHEMICAL AND BIOLOGICAL ACTIVITIES OF ELETTARIA CARDAMOMUM (L.) MATON – A REVIEW. International journal of pharmaceutical sciences and research. 2021 Aug 1;12(8).

10. Cárdenas Garza GR, Elizondo Luévano JH, Bazaldúa Rodríguez AF, Chávez Montes A, Pérez Hernández RA, Martínez Delgado AJ, et al. Benefits of Cardamom (Elettaria cardamomum (L.) Maton) and Turmeric (Curcuma longa L.) Extracts for Their Applications as Natural Anti-Inflammatory Adjuvants. Plants. 2021 Sep 14;10(9):1908.
11. MOULAI-HACENE F, BOUFADI MY, KEDDARI S, HOMRANI A. Chemical Composition and Antimicrobial Properties of Elettaria cardamomum Extract. Pharmacognosy Journal. 2020 Aug 5;12(5):1058–63.
12. Parry J, Hao Z, Luther M, Su L, Zhou K, Yu LL. Characterization of cold-pressed onion, parsley, cardamom, mullein, roasted pumpkin, and milk thistle seed oils. Journal of the American Oil Chemists' Society. 2006 Oct;83(10):847–54.
13. Castillo NET, Teresa-Martínez GD, Alonzo-Macías M, Téllez-Pérez C, Rodríguez-Rodríguez J, Sosa-Hernández JE, et al. Antioxidant Activity and GC-MS Profile of Cardamom (Elettaria cardamomum) Essential Oil Obtained by a Combined Extraction Method—Instant Controlled Pressure Drop Technology Coupled with Sonication. Molecules [Internet]. 2023 Jan 1 [cited 2023 Dec 20];28(3):1093. Available from: https://www.mdpi.com/1420-3049/28/3/1093#app1-molecules-28-01093
14. Cárdenas Garza GR, Elizondo Luévano JH, Bazaldúa Rodríguez AF, Chávez Montes A, Pérez Hernández RA, Martínez Delgado AJ, et al. Benefits of Cardamom (Elettaria cardamomum (L.) Maton) and Turmeric (Curcuma longa L.) Extracts for Their Applications as Natural Anti-Inflammatory Adjuvants. Plants. 2021 Sep 14;10(9):1908.
15. Sewanti.com. 2025 [cited 2025 Mar 5]. Available from: https://sewanti.com/cdn/shop/products/licorice-root.jpg?v=1716831563
16. Husain I, Bala K, Khan IA, Khan SI. A review on phytochemicals, pharmacological activities, drug interactions, and associated toxicities of licorice (Glycyrrhiza sp.). Food Frontiers. 2021 Aug 31;2(4):449–85.
17. Eghlima G, Mashhadi Tafreshi Y, Aghamir F. Regional environmental impacts on growth traits and phytochemical profiles of Glycyrrhiza glabra L. for enhanced medicinal and industrial use. BMC Plant biology. 2025 Jan 27;25(116).
18. Kaur R, Kaur H, Singh Dhindsa A. GLYCYRRHIZA GLABRA: A PHYTOPHARMACOLOGICAL REVIEW . International Journal of Pharmaceutical Sciences and Research. 2013 Jun 17;4(7):2470–7.
19. Gong H, Zhang B, Yan M, Fang P, Li H, Hu C, et al. A protective mechanism of licorice

(Glycyrrhiza uralensis): Isoliquiritigenin stimulates detoxification system via Nrf2 activation. Journal of Ethnopharmacology. 2015 Mar;162:134–9.

20. He Y, Ci X, Xie Y, Yi X, Zeng Y, Li Y, et al. Potential detoxification effect of active ingredients in liquorice by upregulating efflux transporter. Phytomedicine. 2018 Oct 29;56:175–82.
21. Wang Z, Ma J, Yao S, He Y, Miu KK, Xia Q, et al. Liquorice Extract and 18β-Glycyrrhetinic Acid Protect Against Experimental Pyrrolizidine Alkaloid-Induced Hepatotoxicity in Rats Through Inhibiting Cytochrome P450-Mediated Metabolic Activation. Frontiers in Pharmacology. 2022 Mar 16;13.
22. Blogspot.com. 2025 [cited 2025 Mar 6]. Available from: https://4.bp.blogspot.com/-v7MShXV923s/Wm9ghIbkMpI/AAAAAAAAAHA/AG068yErM0oXHNLPR96om-0zubhiZIUggCLcBGAs/w1200-h630-p-k-no-nu/Fineest-Quality-Tinospora-Cordifolia-Powder-From-India.jpg
23. Saxena C, Rawat G. Tinospora cordifolia (Giloy) - Therapeutic Uses and Importance: A review. Current Research in Pharmaceutical Sciences. 2019 Oct 8;9(3):42–5.
24. Singh D. ONE PLANT, ABUNDANT ROLES: Tinospora cordifolia . KRISHI SCIENCE e-Magazine for Agricultural Sciences. 2020 Oct 24;01(04).
25. Darshan P, Singh A, Agarwal A. Chemical constituents and medicinal properties of tinosporacordifolia(giloy). International Journal of Innovative Research & Growth . 2022 Jun 3;11(3):83–7.
26. Singh A. A Review on Traditional uses, Bioactive Chemical Constituents, Pharmacology, and Toxicity of Tinospora cordifolia (Guduchi or Giloy). Research Journal of Pharmacognosy and Phytochem. 2024;16(2):107–11.
27. E. A S, Kumar P, Kumar P, Tripathi A, Sengar P, Tiwari S. Role of Five Medicinal Plants (Giloy/Guduchi, Garlic, Tulsi, Turmeric and Ginger) in Human Immune System . International Journal of Innovative Science and Research Technology . 2023 Feb;8(2):197–205.
28. Kumar Srivastava A, Kumar Singh V. Tinospora cordifolia (GILOY): A MAGICAL SHRUB. Asian Journal of Advances in Medical Science . 2021 Apr 20;3(1):93–101.
29. Montereywildflowers.com. 2017 [cited 2025 Mar 6]. Available from: https://montereywildflowers.com/wp-content/uploads/2017/04/Thistle-Milk-2324-v2-1024x1024.jpg
30. Porwal O, Sheet Mohammed Ameen M, T Anwer E, Uthirapathy S, Ahamed J, Tahsin A. Silybum marianum (Milk Thistle): Review on Its chemistry, morphology, ethno medical uses, phytochemistry and pharmacological activities . Journal of Drug Delivery and Therapeutics . 2019;9(5):199–206.
31. P. N. Denev, M. H. Ognyanov, Y. N. Georgiev, D. G. Teneva, D. I. Klisurova, I. Zh.

Yanakieva. Chemical composition and antioxidant activity of partially defatted milk thistle (Silybum marianum L.) seeds. Bulgarian Chemical Communications. 2020;52(D):182-187.

32. Valková V. MILK THISTLE (SILYBUM MARIANUM): A VALUABLE MEDICINAL PLANT WITH SEVERAL THERAPEUTIC PURPOSES. Journal of Microbiology, Biotechnology and Food Sciences. 2020 Feb;9(4):836–43.
33. Riaz T, Akram M, Laila U, Talha Khalil M, Zainab R. Milk thistle: A review of its phytochemistry, pharmacology and conventional uses . International Archives of Integrated Medicine. 2023 Nov;10(11):31–40.
34. Sonkusare DrS, Chaturvedi DrA. GLUTATHIONE: THE MASTER ANTIOXIDANT AND ITS ROLE IN HEALTH AND DISEASE. The American Journal of Medical Sciences and Pharmaceutical Research. 2023 May 1;05(05):01–4.