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A mini-review on evaluation of the physical, chemical, and sensory properties of raisins produced from grapes with the influence of pre-treatments on sensory properties

A project Submitted to the Department of Chemistry –College of Science –Salahaddin University -Erbil

In partial Fulfillment of the Requirement for the Degree of Bachelor in Chemistry Science

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Dedication:

I dedicate this report with great love to my family. I wouldn't have succeeded in preparing it without their constant support, especially my mother and I also dedicate it to my supervisor, Prof. Dr. Media, thanks for her efforts I dedicate it to the department of chemistry and to everyone who contributed to my support and help, thank you for everyone.

Acknowledgment

First of all, I would like to thank God for giving me the strength for finishing this work, that wouldn't have been possible without him. I also want to express my gratitude to my supervisor, the Prof. Dr. Media, for encouraging me and following up on my project step by step, I really appreciate her effort. Thanks to my family for their support, help and motivation. Thanks to the friends who surrounded me with kindness. Thanks for the chemistry department and all the academic staff. Finally, I want to express my gratitude for Mrs. Hawta for helping with some circumstances.

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Abstract

Raisins are made from the grapes which good source of vitamin, protein, amino acids, fibers and minerals and poly phenolic compounds, aromatic compounds. raisins are rich in sugars (fructose and glucose), minerals (magnesium,iron, potassium, phosphorus, zinc), vitamins (ascorbic acid, pyridoxine, riboflavin and thiamin), dietary fiber, and other active molecules (flavonoids, hydro cinnamic acids, epicatechins, resveratrol, etc). Raisins as part of a diet high in unrefined foods have been shown to have a beneficial effect on decrease blood lipid levels and increase hemoglobin in blood (Iron deficiency). However, reduce the risk of Colon cancer and cardiovascular disease.

The purpose of this **mini – review** detection of chemical composition of the raisin and beneficial effect on the human body.

Keywords: Raisins, poly phenolic compound, Tartaric acid, Anemia,

Colon cancer, thyroid hormones.

1.History

Leaving fruits out to dry in the sun and air is one of the oldest methods of preserving food-whether it's turning grapes into raisins. Raisins and dried fruits are simple, wholesome foods, grown by nature and "made" by men and women basically the same way for thousands of years - long before artificial, frozen, canned, or processed foods. It's said that raisins were discovered when humans stumbled into some grapes drying on a vine. History books record that raisins were sun--dried from grapes as long ago as 1490 B.C. Several hundred years passed before it was determined which variety of grape would make the best raisin. Sometime between 120 and 900 B.C., practical ways were developed to grow grapes to become raisins. During that time, Phoenicians started vineyards in Greece and southern Spain, and Armenians created vineyards in Persia -- now Turkey, Iran and Iraq. These areas not only had ideal climates for growing the fruit, they were also close to the first commercial markets for raisins -- Greece and Rome. The raisin became a favorite fruit of the Greeks and Romans, who used them for everything -- from adorning their places of worship, to honoring winners of sporting contests. Roman doctors prescribed raisins to cure anything from mushroom poisoning to old age. With their growing appeal, raisins increased in value. Two jars of raisins could be traded for one slave in ancient Rome.

4000 BC - Grape cultivation expands to the Tigris-Euphrates region (present-day Iraq) about this time. Grapes join other fruits grown in the neighborhood that are suitable for drying, such as the fig and date palm. (The palm is native to the region but flourishes in Africa and Arabia as well).

California's first raisin crop was grown by nature, not farmers. In September of 1873, a massive heat wave hit the San Joaquin Valley just before harvest. Most of the grapes dried on the vine before farmers could pick them. Not

willing to throw his crop away, one farmer took his raisins to San Francisco, where he found a grocer who agreed to sell the fruit, which was unfamiliar to many customers. Raisins soon became popular enough that a sizable market was created.

In 1876, Scottish immigrant William Thompson found the perfect grape for raisin farmers. He grew a seedless variety of grape called Lady deCoverly, which was thin-skinned, seedless, and sweet. When sun-dried, these grapes became the dark raisin popular today, and with special processing they became the lighter golden raisins. Today, 95 percent of California raisins are made from Thompson seedless grapes grown in the San Joaquin Valley.

1880 - At $3-to-$20 an acre, cheap land and an arid climate set the stage for widespread California raisin production in the areas east of Los Angeles and in the San Joaquin Valley. The Valley grows to be the dominant production area for the entire United States.

1881 - The first Armenians arrive in Fresno County, bringing with them long-held expertise in raisin production.

1900 - Raisin production spreads widely outside of the Mediterranean and California, all the way to Australia and Chile.

1900-1904 - Robert Falcon Scott sets off on his expeditions to the South Polar regions. He includes raisins in his provisions.

1908-1909 - During Robert E. Peary's successful conquest of the North Pole, pemmican (the Native American concoction of dried meat, berries, and fat) along with raisins helps to sustain the party.

1962 - Astronaut Scott Carpenter bites into a raisin-filled, granola-type confection, thus becoming the first person to carry and consume raisins in outer space.

Today - Polyphenolic chemical compounds! Found in high concentration in grapes and wine, they're among the most talked-about dietary ingredients these days. Believed to promote good health since as far back as Roman times, polyphenolic compounds continue to be investigated by modern researchers looking into their antioxidant and other health properties.

Figure 1. (Armenians Raisins production)

2.Introduction

Raisins are one of the important products that are made from grapes.

They are a good source of energy, vitamins and electrolytes by weight raisins contain between 67 – 72% sugars and are high in anti-oxidants but lower in vitamin C than fresh grapes.

They are rich in fiber and phenolic compounds, aromatic compound, volatile compound, pentacyclic triterpenoids, vitamins, carbohydrates, proteins, water and amino acids and trace elements and minerals.

Raisins reduce the risk of chronic conditions such as diabetes, osteoporosis, and cancer and reduce the risk of colorectal cancer. It increases iron levels in the body and lowers cholesterol levels.

There are Four type of Raisin: Black Raisins, Golden Raisins, Red Raisins, Green Raisins. The difference between these four types of Raisins is somewhat arbitrary based on color; however, for the purpose of this research we will use this difference and address each separately. (Rivero-Cruz *et al.*,2009)

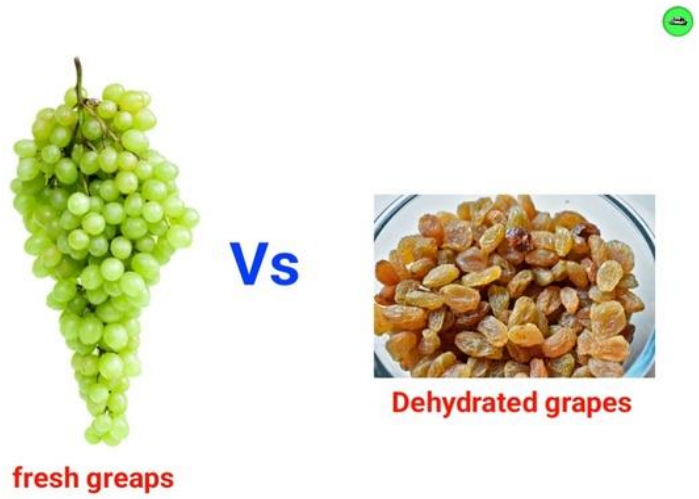


Figure 2. (production of raisin from grapes)

2.1. Black Raisins (Regular Raisins)

Black Raisins are a nutrient-dense snack, containing about 373 Calories per 100 grams. Black raisins are a rich source of potassium (16%) which helps to regulate blood pressure. They also contain low levels of sodium (28%) , which makes them a perfect snack for those with cardiovascular issues or high triglyceride levels. They include 10% of the daily recommended Iron, 8% of the daily recommended Magnesium.

A. Black Raisins Benefits for Skin

Black Raisins are rich in Antioxidants such as Vitamin C and Flavonoids. These Antioxidants help fight free radicals, which may harm your skin cells. Inadequate Iron levels can also cause a pale complexion and dark bags beneath the eyes. However, Black Raisins contain a lot of Iron, so eating them will help you battle Iron deficiency Anaemia and minimize dark circles.

B. Black Raisins Benefits for Female

Black Raisins are loaded with Calcium & Boron, which are crucial for keeping your bones strong and healthy. This is especially important for women, as they're more prone to bone issues as they age. Trying to shed some pounds? Black Raisins are a low-fat, low-calorie snack that can help you feel full and satisfied without packing on extra pounds. for the male, the natural sugars in Black Raisins provide a rapid energy boost, which can be useful for strenuous activity and maintaining energy levels throughout the day. Black raisins include Potassium, which is essential for muscular function and recovery from exercise. Including Black Raisins in post-workout snacks or meals can assist replace electrolytes and aid muscle repair.

2.2. Golden Raisins

Golden raisins are also a great source of antioxidants, which can help protect the body from free radical damage. They are also a good source of dietary fiber, which can help promote healthy digestion. Regular raisins are also a good source of dietary fiber, but they contain fewer antioxidants than golden raisins. golden raisins are typically sweeter and moister than regular raisins. In addition, golden raisins tend to be softer than regular raisins due to the sugar solution they are soaked in before drying. These differences make golden raisins a better choice for those looking for a sweet and moist texture. Golden raisins (which are treated with SO2) had the highest amount of hydroxycinnamic acids and the highest lightness values.

Nutrition Facts Golden Raisins	
Total Fat 0.5g	1%
Saturated Fat 0.2g	1%
Polyunsaturated Fat 0.1g	
Monounsaturated Fat 0g	
Cholesterol 0mg	0%
Sodium 12mg	1%
Total Carbohydrates 80g	29%
Dietary Fiber 4g	14%
Protein 3.4g	
Iron 1.8mg	10%

Potassium 746mg	16%
Calcium 53mg	4%

Table 1. (Nutrition Facts Golden Raisins)

2.3. Red Raisins

They can reduce the risk of diabetes: Red raisins are rich in fiber, which helps regulate blood sugar levels and reduce the risk of diabetes. Excellent for dental health: Red raisins contain natural compounds that can help prevent cavities and gum disease.

Nutrition Facts Red Raisins	
Total Fat 0g	0 %
Potassium 310mg	9%
Total Carbohydrates 31g	10 %
Sodium 10mg	0%
Fiber	8 %

Table 2. (Nutrition Facts Red Raisins)

2.4. Green Raisins

They also consist of a great number of essential nutrients per 100g like protein which is 3.3g, along with 2g(10 %) of dietary fiber, Total Carbohydrate 80g (29%), 2.3mg of Vitamin C, 98mg of Phosphorus, and 1.8mg of Iron. The other nutrition obtained from Raisins is Vitamin E, Vitamin K, Zinc, and Sodium. green raisins used for treating anemia,

preventing cancer, improving digestion, preventing hair loss, improving skin diseases, alleviating joint pain, adjusting the body's pH level, reducing fevers, and strengthening vision health, and increasing energy.

Component	Bioactive Classification	Potential Benefit
Boron	Mineral	• Supports growth of healthy bones • Maintains healthy bones and joints
Fiber, including Pectin	Non-digestible Carbohydrate	• Colon cancer protection • Cholesterol lowering • Protection from cardiovascular disease • Support of colon health and function
Pectin	Non-digestible Carbohydrate	• Cholesterol lowering
Fructans	Prebiotic	• Stimulation of health-promoting colonic microflora • Support of colon health • Stimulation of calcium and magnesium absorption • Colon cancer protection
Tartaric acid		• Support of colonic health and function • Enhance mineral absorption
Betulin, oleanolic and betulinic acids	Triterpenes	• Anti-cavity, gum disease protection

Isoflavones: Daidzein and Genistein	**Phytoestrogens (Polyphenols)**	**• Antioxidants, protection from oxidative stress** **• Cancer protection (breast, prostate, colon)** **• Cardiovascular disease protection** **• Osteoporosis protection** **• Alleviate menopausal symptoms**
Hydroxycinnamic acids and derivatives (e.g. caftaric and coutaric acids)	**Phenolic acids**	**• Antioxidants, protection from oxidative stress** **• Cancer protection** **• Anti-inflammatory**
Flavonols (e.g. quercetin and **kaempferol)**	**Flavonoids (Polyphenols)**	**• Antioxidants, protection from oxidative stress** **• Cardiovascular disease protection** **• Cancer protection** **• Anti-inflammatory**

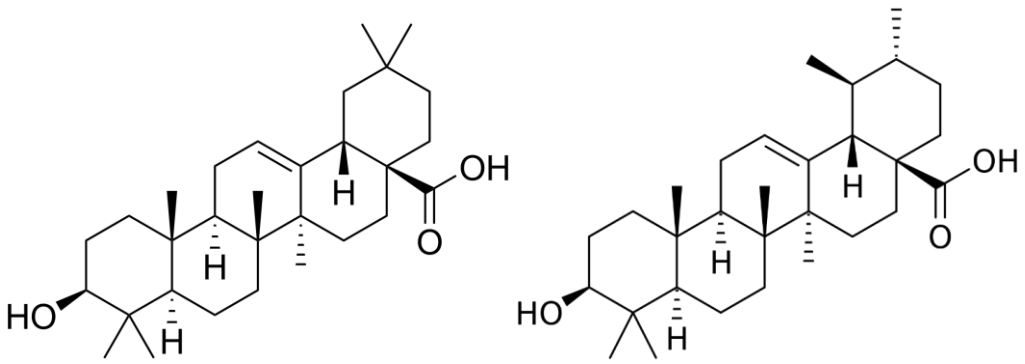
Table 3. (Summary of Sun-Dried Raisin Components of Physiologic Interest)

4.Phytochemicals compounds:

4.1. Pentacyclic triterpenoid compound

Oleanolic acid (3β-hydroxy-olea-12-en-28-oic-acid, OA) and its isomer, ursolic acid (3β-hydroxy-urs-12-en-28-oicacid, UA), are natural triterpenoids. Both of these compounds, have anti-inflammatory, anti-bacterial, anti-tumor, anti-HIV and immunoregulatory activities, in addition to providing hepatoprotection (Liu, 1995; Ovesná et al., 2004; Liu, 2005).

These triterpenic compounds are known to exist in many plant species, including medicinal herbs such as rosemary, thyme and ginseng. OA and UA are also present on the surface of fruit skins, such as those of grapes, persimmons and olives. However, as the skins of fresh fruits may be removed when eaten, fresh fruits may not be a significant source of OA and UA intake for many people. Because the solubility of OA and UA in wine or juice is quite low, they also remain on the fruit surface following processing, including washing and squeezing steps. As a consequence, fruit juices and wines do not contain significant levels of these compounds either. However, unlike fresh fruits, dried fruits are usually eaten without removing their skins, and may be a good source for the natural oral intake of OA and UA. Their ingestion could therefore provide beneficial health effects. For instance, it is known that raisins, the dehydrated form of grapes, contain OA, and that extracts from raisins inhibit the growth of Streptococcus mutans, the oral pathogenic bacteria that causes tooth decay (Rivero-Cruz et al.,2009). While dried fruits are a popular snack worldwide, with a variety commercially available in any given country, little is known about the OA and UA content of dried fruits other than raisins.



Oleanolic acid Ursolic acid

Figure 3. (Oleanolic acid and Ursolic acid)

4.2. Polyphenolic compounds

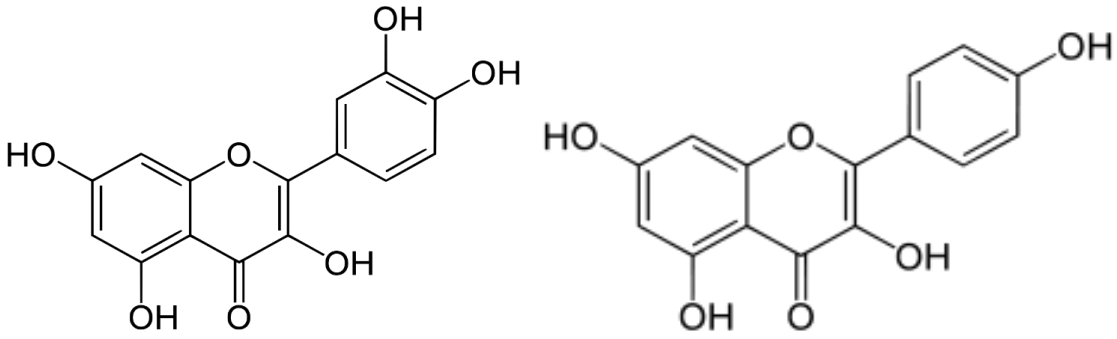
The polyphenolics of raisins were extracted, separated by HPLC, and characterized by their UV-vis spectra, and their concentrations measured.

Raisins are rich in phenolic compounds: flavonoids and phenolic acids. Flavonoids are not only potent antimicrobial antioxidants but also have a multitude of functional capabilities, which may have an effect on health. Raisins provide the flavonoids quercetin, kaempferol and rutin, and are among the richest fruit sources of the isoflavones daidzein and genistein. Raisins are also a good dietary source of the phenolic acids caftaric and coutaric acids. By virtue of their antioxidant activity, these raisin constituents may lower oxidative stress in humans and thereby lower risk of chronic disease. The brown color of raisins is a combination of pigments

produced by polyphenol oxidase activity and nonenzymatic reaction. Raisins are an excellent source of polyphenols in the American diet. Polyphenols make up the largest group of phytochemicals in the diet and they appear to be, at

least in part, responsible for the potential health benefit associated with the consumption of diets abundant in fruits and vegetables.

Polyphenols are synthesized by all vascular plants and are therefore present in all plant foods contributing to their color and taste. Polyphenols have many functions essential to plant growth and survival. In animals and humans who consume them, they affect cellular biochemistry. They are potent antioxidants and may protect cell constituents against oxidative damage. They chelate metals, modulate enzymatic activity, inhibit cellular proliferation and alter signal transduction pathways. Current evidence strongly supports a role for polyphenols in the prevention of cardiovascular disease, cancer and osteoporosis and suggests a role in the prevention of neurodegenerative diseases, diabetes and inflammatory disorders. On the other hand oxidized cinnamics and protocatechuic acid were only detected in sun-dried and dipped raisins. Golden raisins contained the highest amount of *trans*-caftaric and *trans*-coutaric acids. Sulfur dioxide curtails oxidation in these raisins resulting in a higher phenolic content. When compared to fresh grapes.



Quercetin kaempferol

Figure 4. (Quercetin and kaempferol)

4.2.1. Daidzein and genistein

Daidzein and genistein are isoflavones with estrogenic activity in humans, and therefore are known as phytoestrogens. Structurally they resemble 17β estradiol and in in vivo assays they compete with the hormone at the receptor level. As other flavonoids, they may act as cellular antioxidants; they are potent tyrosine kinase inhibitors and affect cell cycle. They have been shown to protect against breast, prostate and other cancers, lower risk of cardiovascular disease and alleviate menopausal symptoms.

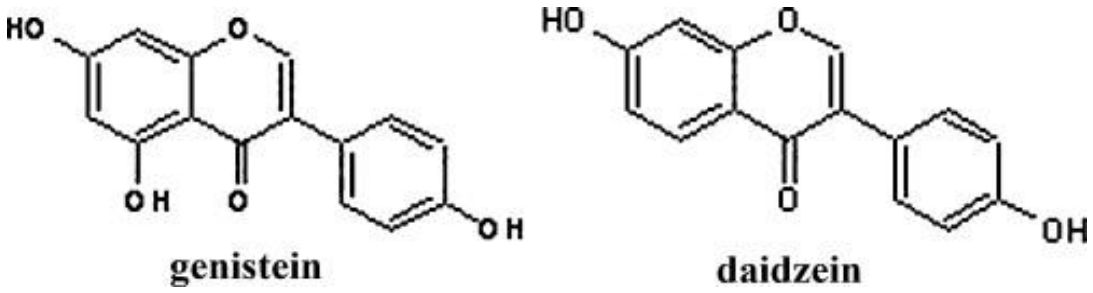


Figure 5.(Genistein and Diadzein)

5. Nutrient Composition:

5.1. Carbohydrates, vitamins and minerals

Raisins, like most fruits, possess a combination of an appealing, sweet taste and nutritional value. Raisins provide essential nutrients, soluble and insoluble fiber, and health protective bioactive components, or phytochemicals. compositions of raisins and of Thompson Seedless grapes as a reference.38 Both raisins and grapes provide similar amounts of sugar (19.6g and 21.4g, respectively), divided almost equally between fructose and glucose with

minimal amounts of sucrose. Raisins, like all fruits, are high in potassium and low in sodium. Compared to other fruits, they are high in magnesium and iron.

5.2. Boron

Raisins are among the 50 major food contributors of boron in the American diet, having the highest concentration of boron at 2.2mg per 100g.39 Boron, a putative essential trace is crucial for the growth and maintenance of healthy bones and joints. Boron may also have a preventive or therapeutic effect on osteoporosis by reducing bone calcium loss in postmenopausal women. Controlled boron deprivation studies indicate that boron has an essential role in maintaining bone density. In clinical studies including both men and women, boron supplementation after consumption of a low-boron diet increased previously suppressed 25-hydroxycholecalcipherol (vitamin D) levels. Supplementation of a low-boron diet with an amount of boron commonly found in diets high in fruits and vegetables induced changes in postmenopausal women consistent with the prevention of calcium loss and bone demineralization. In one study, estrogen therapy increased serum 17-beta-estradiol in postmenopausal women but not if they were fed low-boron diets. Although a mechanism that explains how boron affects bone formation and remodeling has yet to be defined, it appears that dietary boron may be required to convert estrogen and vitamin D to their more active form (17-beta-estradiol and 1,25-OH2D3, respectively). Recent animal studies support this hypothesis as results indicate that boron works synergistically with estrogen to exert its beneficial role on calcium and magnesium homeostasis. Investigators believe that boron may be an important nutritional factor determining the incidence of osteoporosis. In conclusion, raisins are rich in boron, a mineral which is important for bone growth and maintenance. Boron in raisins may protect against osteoporosis by preventing bone loss and may have a role in preventing arthritis.

5.3 Fiber

High fiber diets have been promoted to help reduce the risk of developing various conditions, including constipation, heart disease, diabetes, diverticular disease, colon cancer and obesity. The Institute of Medicine and the Dietary Guidelines for Americans 2005 recommends that children (ages 1 and up) and adults consume 14g of fiber for every 1,000 calories of food they eat each day.49 50 However, most Americans consume far less fiber than the recommended amount. Dietary fiber intake among adults in the US averages about 15g. Raisins are a good source of soluble and insoluble fiber and help meet dietary fiber recommendations. It is important to be aware that raisins provide over 5g of fructans per 100g (Figure 1). Fructans, also known as fructooligosaccharides (FOS), are fructosyl units bound by a beta (2-1)-glycosidic linkage. They are formed from the sugars in the grapes during the dehydration process.Fresh grapes themselves have no detectable fructans. Both the American Association of Cereal Chemists and the Food and Nutrition Board definitions include fructans as components of dietary fiber. Yet, compounds in this group, which includes inulin, are soluble in aqueous ethanol and thus are not recovered in the Association of Official Analytical Chemists dietary fiber methods. Adding fructans to total fiber values of raisins nearly doubles their fiber content, suggesting that raisins can provide more fiber in the diet than was previously believed. In conclusion, raisins are a high fiber food. Even a single serving of raisins provides a significant amount of fiber in a daily diet and can have beneficial effects on colon health. Adding fiber from high fiber foods such as raisins is preferable to using isolated fiber supplements because raisins deliver additional nutrients and phytochemicals that may also help to lower disease risks in other ways.

6. Phytochemicals and Other Raisin Components of Physiologic Interest:

6.1. Prebiotics, Raisins and Health

Raisins, unlike grapes, are a significant source of prebiotic compounds in the American diet. An important effect of increasing fiber in the diet is its impact on the intestinal microflora. The growth of bacteria in the colon depends on the substrates that are available to them, i.e. compounds that have not been digested in the small intestine. A prebiotic has been recently defined as "a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon. Sun-dried raisins contain 5.7g fructans per 100g of fruit,51 higher than all commonly consumed fruits. Fructans escape digestion in the upper g.i. tract and reach the large intestine practically intact. Here they are fermented by bacteria that can cleave the beta (2-1)-glycosidic bonds between fructosyl units and act as prebiotic compounds by selectively stimulating the growth of beneficial intestinal microflora, namely bifidobacteria and lactobacilli. Clinical studies have shown that when taken in the diet, even at relatively low levels (5-20g/day), fructans increase manifold the numbers of these bacteria in the colon mucosa. A balanced microbiota in the intestinal track is essential for health and well-being. Prebiotics, such as fructans, help keep this balance by selectively stimulating the growth of health-promoting bacteria. The products of colonic fructan fermentation are lactic acid and short-chain fatty acids (SCFA), mainly acetate, propionate and butyrate, which play a significant role not only in colonic health but also the well-being of the entire organism.

The production and presence of SCFA and lactate in the colon alter the surroundings, creating a bacteriocidal environment for enteropathogens such as Escherichia coli and Clostridium perfringes. Including 120g of sun-dried raisins for 9 weeks in the diet of healthy adults increased total SCFA excretion.

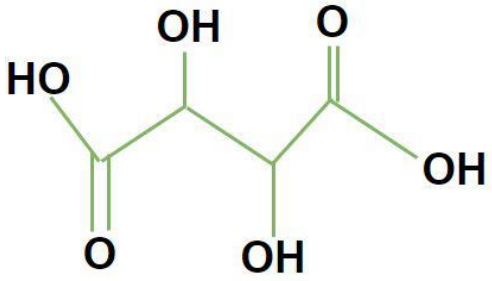
Prebiotics in raisins may play a role in colorectal cancer protection. Prebiotics in raisins may offer cardiovascular benefits through a triglyceride- and cholesterol-lowering effect. fructans, like other soluble dietary fibers, reduce the capacity of hepatocytes to synthesize triglycerides from palmitate and so lower net hepatic triglyceride synthesis.

In conclusion, fructooligosaccharides (fructans), formed from grape sugars during dehydration, give raisins a unique set of health benefits. Not only do they increase dietary fiber content and help regulate bowel functions, but acting as prebiotic agents, they stimulate health-promoting intestinal flora, maintain intestinal balance, may contribute to cardiovascular health, may protect from colon cancer, may increase absorption of calcium and magnesium and so enhance bone mineralization during growth and protect from osteoporosis after menopause. Humans have shown beneficial effects of fructans at doses as low as 7g per day. A single serving of raisins provides about a third of this amount. During the production of raisins, the dehydration process converts part of the grape sugars into fructan, a form of fiber. While fructans are not detectable in grapes, in raisins, the fructan content can be up to 8%.

6.2. Tartaric Acid

Sun-dried raisins have beneficial effects on colonic function that go beyond those due to their fiber content alone. Grapes and raisins are the only fruits that contain significant levels of tartaric acid (TA) in temperate regions of the world. Because of its low solubility in water, some of the TA in grapes is lost during processing of grape juice and wine. raisins contain 2.0-3.5g/100g of TA. Studies on tartaric acid have shown that its presence in the diet has a positive impact on colonic health. tartaric acid and fiber in raisins work synergistically to maintain a healthy digestive system. They also make a strong case for the

advantages of combining foods with beneficial effects, such as raisins with high cereal fiber foods. tartaric acid has also been shown to help increase the bioavailability of minerals in the diet, such as calcium and iron. *In vitro* studies indicate that tartaric acid increases the uptake of iron by Caco-2 cells by lowering intestinal pH and by forming soluble iron-acid complexes, especially with ferric ion. Studies using *in vitro* simulated gastrointestinal digestion showed that tartaric acid increases the calcium availability from vegetables. Investigators trying to find a way to reduce the rates of anemia in India developed an iron-fortified biscuit and tested iron bioavailability with and without tartaric acid. They found that by adding tartaric acid, they were able to increase iron availability by 338%. Tartaric acid content of grapes and raisins make a strong case for adding these fruits to foods where minerals are poorly absorbed. Raisins paired with iron-fortified cereals will enhance iron absorption; raisins in vegetable salads may not only add zest but may enhance calcium absorption. Unlike other fruit acids (such as malic and citric acid), tartaric acid bypasses the small intestine and is fermented by colonic bacteria to produce short-chain fatty acids (SCFA). As discussed in the previous section, these acids play a significant role not only in colonic health but also in the well-being of the entire organism. Tartaric acid may act synergistically with fructans to enhance the potential of raisins as a prebiotic food.



Tartaric Acid

Figure 6.(Tartaric Acid)

6.3. Aromatic and Volatile Compounds

Raisins are produced by drying grapes. Basically, drying preserves the fruits by the inactivation of the majority of biochemical and physical reactions, the inhibition of microorganism growth, and by slowing down th enzymatic degradation. Solar radiation is a natural source of drying which produces raisins dark in color with a fatty and roasted aroma.

Aroma is a vital sensory characteristic that determines consumers' acceptance. It arises from many volatile compounds (VOCs) whose composition and concentration vary within different varieties and species, vintage, geographical regions, storage conditions, drying methods, and type of packing. The Maillard reaction (MR), and the oxidation of lipids (unsaturated fatty acid) and carotenoids are the major sources of raisins and grapes VOCs. The VOCs of fruits are primarily comprised of aldehydes, volatile fatty acids, C13-norisoprenoids, monoterpenes, and alcohols. The hydrolyzation of identified glycosidically bound VOCs in fruits are responsible for the intensified aroma. The aroma produced by free-form VOCs can be sensed directly in grapes or raisins; thus, it is considered a vital component. Drying methods have a significant impact on the sensory characteristics and consumer preference for raisins. The main difference between grapes and raisins is the water content and two main methods of drying grapes are used to produce raisins. One method is sun-drying for 2–3 weeks and the other is a short (15–20 s) exposure to hot water (87–93ºC) followed by dehydration at 71°C for 20–24 h. Many new methods of dehydration have been developed, including microwave vacuum-drying, dipping pretreatments to expedite the drying process or chamber-drying at a controlled temperature. In Tunisia, sun-drying is the most ancient and most frequently used method, which consists of exposure to hot water (87–93°C) followed by drying for 2–3 weeks under direct sunlight.

Analysis of the volatile compounds in plant extracts has attracted increasing interest due to the use of these components in both the food and pharmaceutical industries. Moreover, phenolic and aromatic compounds as well as carbohydrates are concentrated during grape dehydration. These are very important parameters for judging the market quality of fruit. To evaluate the volatile compounds, various methods have been developed for their extraction, including hydro distillation, supercritical fluid extraction and headspace solid phase micro-extraction (HS-SPME). HS-SPME is a simple, sensitive, and solvent-free sampling and concentration technique that can be used in combination with gas chromatography–mass spectrometry (GC–MS) for analysis of the volatile components of natural products and foods. Gök Üzüm raisins produced from grapes dipped into the WA solution presented higher contents of most of the studied volatile compounds (including the total contents of C6 compounds, alcohols, benzenoids, esters, aldehydes, terpenes and C_{13} norisoprenoids) and lower contents of (Z)-2-hexenol and 2-hexenoic acid than the raisins produced from grapes dipped into K_2CO solutions. Gök Üzüm raisins were characterized by fruity, floral and grass aromas according to their odor activity values. Drying Gök Üzüm grapes after the treatment of WA solutions promotes a higher aromatic composition compared to K_2CO solutions.

Figure 7. (C_{13} norisoprenoid)

7. Thyroid Gland Function and Hypercholesterolemia

Dyslipidemia is a common health problem linked to high morbidity and mortality. It is an important risk factor for coronary artery disease and stroke because of atherosclerotic plaque deposition in the coronary arteries. Moreover, it increases the risk for thromboembolism and kidney affection

that may progress to glomerulosclerosis or tubulointerstitial injury. Dyslipidemia downregulates the activity of lipoprotein lipase enzyme, present in the endothelium, fatty tissue and muscles) and hepatic lipase resulting in the decrease of lipoprotein clearance and increase of lipoprotein synthesis.

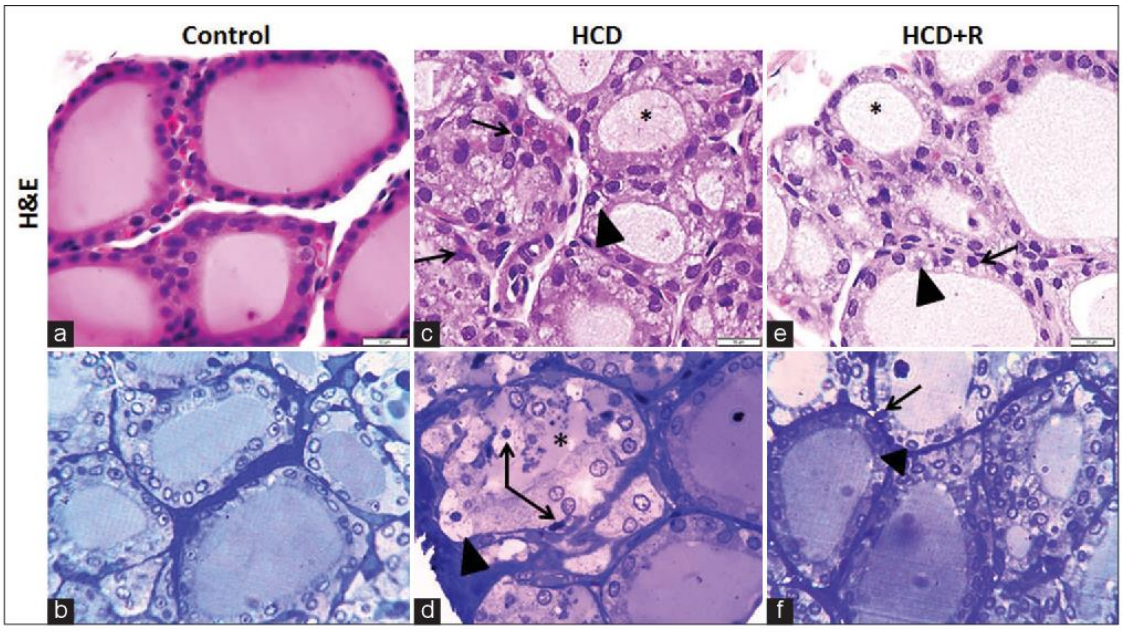
In dyslipidemia, the levels of low-density lipoprotein (LDL) cholesterol and triglycerides (TG) are high, while the level of high-density lipoprotein (HDL) cholesterol is low. are at a 50% risk for coronary diseases while the risk is about 30% in untreated females by the age of 60 years. In Egypt, cardiovascular deaths are very common and represent about 15% of the cardiovascular deaths in the Middle East and North Africa. Moreover, dyslipidemia has a high prevalence that may reach up to 71% in Egyptian females. Thyroid hormone plays a regulating role in lipid synthesis, metabolism, and mobilization. Among the characteristic features of hypothyroidism are elevated levels of serum cholesterol, LDL cholesterol (LDLC), apolipoprotein B (apo B), and lipoprotein (a). High-fat diet and endocrinal malfunction account for metabolic syndrome and insulin resistance.[7] There are many categories of drugs that can lower cholesterol levels. Statins are considered the first line for controlling dyslipidemia. [8,9] Statins can decrease levels of LDL through inhibiting the activity of

3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase, which resulting in decreased liver cholesterol and increased LDL receptors in the liver, which increases LDL clearance. Studies showed that statin use may

induce diabetes mellitus, peripheral neuropathy, depression, Parkinson's disease, cognitive impairments, dysfunctional breathing, interstitial pneumonitis, hearing loss, early premature cataracts, herpes zoster, bladder wall instability, interstitial cystitis, impotency, and cancer. Ezetimibe is a dyslipidemic agent used to treat people with hyperlipidemia. Ezetimibe is an inhibitor of intestinal cholesterol absorption and is indicated in reducing total cholesterol, LDL, apo B, and non-HDL. However, ezetimibe may rarely cause acute autoimmune hepatitis or severe cholestatic hepatitis. Bile acid sequestrants, for example, colestipol, and colesevelam, can manage hypercholesterolemia via binding with intestinal bile acids and interfering with their reabsorption. Therefore, a compensatory increase in bile acid synthesis takes place in the liver through the conversion of cholesterol into bile acids. When the level of hepatic cholesterol is decreased, hepatic LDL receptors are up-regulated, causing increased LDL clearance. However, Bile acid sequestrants may affect the gastrointestinal tract and is associated with constipation that might be severe. Moreover, patients usually have abdominal discomfort, bloating, and aggravation of hemorrhoids. Hence, a large number of patients discontinue bile acid sequestrants therapy. On the other hand, many studies showed that there are natural compounds can be effective in lowering serum cholesterol.

Raisins, the dried grapes of different cultivars of *Vitis vinifera*, are widely consumed all over the world. Raisins contain a large amount of phenolic acids, polyphenols, and flavonoids which are powerful antioxidants.

They chelate metals, inhibit cellular proliferation, modulate enzymatic activity and signal transduction pathways. Intake of raisins with high-fat diet reduced mesangial expansion, glomerular capillary congestion, and fibrosis of the kidney. Moreover, raisins had a cardio-protective effect and were able to preserve the function and structure of cardiac muscle in hypercholesterolemic rat model through decreased blood vessels affection, cellular infiltration and cardiomyocytes' degeneration. In addition, raisins reduced immunoexpression of alpha-smooth muscle actin and hence decreased fibrosis. In hypercholesterolemic rats, ingestion of red grape juice could alleviate the high cholesterol diet (HCD)-induced structural changes in the thyroid gland, decrease both thyroid hormones and blood glucose levels, improve the lipid profile and increase anti-oxidants levels. No studies have assessed the efficacy of raisins in alleviatingthe impact of hypercholesterolemia on the thyroid gland.



gland of control (a and b), hypercholesterolemic (c and d) and hypercholesterolemic rat treated with raisins (e

Figure 8. (Thyroid gland)

Thyroid gland of control (a and b), hypercholesterolemic (c and d) and hypercholesterolemic rat treated with raisins (e and f). Note, the thyroid follicles of the control rat appear intact while those of hypercholesterolemic rat showing irregular follicles with little and vacuolated colloid (*) and some follicular cells have vacuolated cytoplasm (arrow head) and pyknotic nuclei (arrow). Thyroid gland of hypercholesterolemic rat treated with raisins showing more or less intact follicular shape and epithelial lining apart from few follicles that show vacuolated follicular cells (arrowhead) with dark nuclei (arrow) as well as vacuolated colloid (a, c, e stained with H and E and b, d, f stained with Toluidine blue ×400).

8. Iron deficiency (Anemia)

Iron is an important essential mineral which is vital for many of the biological functions of the body. Iron in the body is primarily involved in oxygen transport as well as in various biological activities like cellular proliferation, electron transfer and enzymatic reactions. Report by the World Health Organization shows that of the nutritional disorders, iron deficiency anaemia is one of the most common which has major effect on both health and economy. Iron deficiency (ID) affects a major part of the population in almost every country in the world. Anaemia is also the reason for disability as well as mortality among large group of population around the globe. The susceptibility of anaemia is more in children, adolescents and women of child-bearing age including pregnant women.

The main cause of anaemia is not only due to low iron intake but also poor iron absorption. Anaemia is characterized by low concentration of haemoglobin and hence their tissues get less oxygen than the required amount. Anaemia results in decrease in overall physical growth of children decrease in cognitive performance as well as compromised immune status. This global health

problem can be addressed by improving the dietary iron bioavailability. Epidemiological studies have shown a consistent, inverse relationship between a diet rich in fruit and vegetables and a lower risk for many chronic diseases including cancer World Health Organization. Steinmetz and Potter heart disease and stroke. Researchers are also investigating the beneficial role of fruits and vegetables in inflammatory diseases such as arthritis; in lowering the incidence of obesity and controlling diabetes and in age-associated neurological problems such as Alzheimer's and Parkinson's Disease. Fruits and vegetables also appear to have a role in the prevention of cataracts and macular degeneration, and may also protect from osteoporosis. Finally, they may enhance the immune system and potentially modulate certain aspects of immune function. The protective effect of an abundance of fruits and vegetables in the diet is long lasting. Higher intake of fruits and vegetables during childhood is associated with a lower incidence of cancer and stroke, respectively, during adulthood. Raisins which is available world-wide, should be of particular interest in these investigations due to their unique phytochemical composition and the natural qualities that make raisins an appealing source of nutrients. In the United Kingdom, Ireland, New Zealand, and Australia, the word "raisin" is reserved for the dark-colored dried large grape.

Raisins, like other fruits, are devoid of fat, saturated fat and cholesterol. They provide both soluble and insoluble fiber at levels that represent a meaningful contribution to daily fiber intake and at levels that benefit cardiovascular health. The aim of the present study is to show up the impact of Raisins (Vitis vinifera L.) intake on the level of some blood tests in a group of female volunteers.

9. Microbiological Quality of Raisin Dried by Different Methods

Raisins are one of the important products that are made from grapes. Because of importance of our country in Raisin export, the use of the best ways to preparation and production and also observance the factors affecting quality of products have particular importance (Pahlavanzadeh *et al.*, 2001). Until Twenty-five years ago, Iran was one of the most important countries in the supply of world's Raisin. But because of the lag in technology and processing, low quality of produced Raisins and disobedience of international standards lead to decrease in export of products (Vagenas and Kouris, 1991). Drying is one of the oldest methods for keeping human food. This method is based on the reduction in food water, or in other words the reduction of water activity in foods which leads to reduction in microbial, chemical, biochemical processes and increases the shelf life of products. Although the solar drying method has a long history, yet this style of food drying is scientific and practical method used in most developed countries. Because this method is simple and inexpensive (Pangavhane and Sawhney, 2002). However, these methods have disadvantages Including the possibility of product contamination due to direct exposure to environmental factors, insects, birds and rodents attacking and long drying time which has a negative effect on the economic aspects (Kostaropoulos and Saravacos, 1995). Therefore, to increase quality and reduce drying time and drying methods have recently been proposed. In This study, we compared microbial count including *Salmonella*, *coliform*, *E. coli* and fungi of Raisins which dried by shade and solar drying methods.

10. Material and Methods

10.1. Drying Methods of Raisin

10.1.1. Solar drying

In this way, the grapes were picked in the mesh trays and placed in the open environment exposed to direct sunlight. During the drying, the temperature range was 18- 39 °C (Pangavhane and Sawhney, 2002).

10.1.2. Shade drying

In this method, after putting grapes in mesh trays, they put in an enclosed room and left to dry in the shade. The temperature used in this method was 20- 35 °C (Pangavhane and Sawhney, 2002).

10.2. Microbial Count

10.2.1. Coliform

Total *coliforms* were estimated on violet red bile agar (VRBA) (Microbial) incubated for 24–36 h at 37°C and 44°C respectively. Isolates were examined for colony morphology, lactose fermentation on VRBA, Gram stain, oxidase test and triple sugar iron fermentation test (Pisano *et al.*, 2006).

10.2.2. E. coli

E. coli strains were isolated on Eosin Methylene Blue agar (EMB: Difco, Detroit, Michigan). Five lactose fermenting colonies were selected from each plate and examined by physiological tests (Clermont *et al.*, 2000).

10.2.3. Salmonella

For detection of *Salmonella spp*., 25 g of each sample were homogenized in 225 mL of buffered peptone water (Microbial) and incubated for 24 h at 37 ºC, then 0.1 mL was sub-cultured in 10 mL of selenite cystine (SC) broth (Microbial) and Rappaport Vassiliadis (RV) broth (Microbial) and incubated for 24 h at 37°C and 42°C, respectively. Then a loopful of SC broth and RV broth was streaked on Hektoen agar (HA) (Microbial) and brilliant green

modified agar (Microbial) and plates were incubated for 24-48 h at 37°C. Suspected colonies were further screened biochemically and serologically (Clermont *et al.*, 2000).

10.2.4. Yeasts and *moulds*

Yeasts and *moulds* were enumerated using potato dextrose agar (Microbial) with chloramphenicol (0.01%), and incubated at 25°C for 5 days. The isolates were identified using the tests reported by Kurtzman and Fell (Kurtzman *et al.*, 2011).

The results indicate that Salmonella and E. coli were not detected in both samples but Coliforms significantly have observed. Molds and yeasts were in higher levels in raisin samples. Also, fungi count in shade drying method found in lower level in compared with solar drying method because of SO2 treatment, without exposure to environment contamination and lower process time in shade drying method. Finally, shade drying process can be suggested as better process for raisin production but residues of sulphur after shade drying process are not safe absolutely.

11. Conclusion

According to the scientific evidence presented in this review, despite their high content of sugar, raisins are a source of beneficial components and a healthy snack. Due to their composition, they contribute to a better diet quality, and their consumption before a meal could be favorable for regulating appetite in normal-weight healthy subjects. Eating raisins may reduce hunger and a_ect dietary intake by altering hormones influencing satiety, thus diminishing the energy intake of the meal, which in turn could help to maintain a correct body weight. Their antioxidant capacity has been extensively demonstrated and correlated to the phenolic content, and although this may be an indication of

their potential to exert beneficial effects on human health, more scientific evidence in intervention studies is required. Due to their phenolic components and high fiber content, raisins may improve cardiovascular health parameters by increasing the plasma antioxidant capacity and lowering total and LDL cholesterol levels, systolic blood pressure and molecules linked to inflammation response. Incorporating raisins to the daily diet seems to lower some CV risk factors, even though these effects were not appreciated in overweight individuals. Moreover, raisins have a low-to-moderate GI, which makes them a healthy choice for diabetics or those with insulin resistance, and their consumption could be linked to a lower risk of T2D. The potential of raisins to preserve a good dental health has also been demonstrated, due to their antibacterial activity, low adherence to teeth and an oral pH not below the threshold that damages enamel. Raisin intake might also be favorable for colon function and their prebiotic content seems to affect gut microbiota. It would be of great interest to perform more studies concerning the impact of raisin intake on gut microbiota and colon function before drawing any clear conclusion. Cell line and animal model studies have shown interesting results, suggesting the investigation of consuming raisins in other diseases, such as cancer and Alzheimer's disease, but in intervention studies with humans. Although raisins have shown to be a potential beneficial food, deeper and further research is required to state whether eating raisins could be favorable and beneficial for preserving a good health. Overall, with the research done so far, it seems that adding 80–90 g of raisins to the daily diet may be favorable for human health. However, more intervention studies with specific biomarkers are required.

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