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GRAPES RAISIN: ITS NUTRITIONAL PROFILE AND HEALTH BENEFITS -A REVIEW

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ABSTRACT

Now a days, the demand for healthy food products is rapidly increasing. Researcher are highlighting the impact of diet on human health and nutrition, leading to increasing number of consumers choosing food based on their nutritional value and potential health benefits. Raisins are popular dried snack that are consumed worldwide, contain beneficial components for human health. They are important source of micro- and macronutrients, providing sugars, vitamins, minerals and dietary fiber, which has prebiotic effects. Furthermore, they are rich in a variety of bioactive substances, including polyphenol such as caffeic acid and coumaric acid, as well as flavonoids such as quercetin and kaempferol. Raisin possess a low to moderate glycemic index, which makes them a healthy snack. They seem to contribute to a better diet quality and may reduce appetite. Antioxidant capacity has been correlated with phenolic content and this may be involved in the improvement of cardiovascular health. Adding an 80-90 g raisin into the daily diet may be favorable for human health.

Key words : Raisin, Bioactive compound, Glycemic index, Antioxidant properties.

Introduction

Dietary guidelines around the world unanimously recommend an increase in the consumption of fruits and vegetables. According to the “My Plate for the Day” (NIN) recommendation, a healthy diet needs to include nearly 500 g of vegetables and fruits accounting for at least 8% of the daily calorie intake. Fruits are an important source of many essential nutrients, such as potassium, dietary fiber, vitamin C and folate, which are naturally low in fat, sodium and calories. More than 80% Indian population do not meet this recommendation. The NIN (National Institute of Nutrition) identified vitamin A, vitamin D, vitamin E, folate, vitamin C, calcium, iron (for certain age and gender groups), magnesium, potassium, and fiber as “shortfall nutrients” as these nutrients are being consumed at levels below those recommended and of these, vitamin D, calcium, iron, potassium and fiber are being underconsumed to the extent that may pose a public health concern (Dietary Guidelines for Indian, 2011). Unhealthy dietary habits are the leading risk factors for disease burden in India, contributing to more than half of the due to coronary heart disease, hypertension and diabetes.

Dried fruit is a popular snack due to its bioactive compounds and many nutritional and functional properties (Sharma *et al*., 2013). They are used in the diet because of their unique aroma and texture. Apricots, dates, figs, prunes (dried plum), especially raisins (*Vitis* spp.) are the most popular dried fruits. It can also be added to foods such as cereals, bakery products and confectionery products and mixed with nuts. Compared to fresh fruits, dried fruits consist mainly of carbohydrates, such as mono-carbohydrates, fibres, antioxidants, vitamins and polyphenols. Raisins are popular dried fruit as they contain easily digestible fibers and a wide range of phenolic compounds, vitamins, minerals and sugars with high health

and nutritional value (Somkuwar *et al*., 2020). Raisins are consumed all over the world and, due to their unique nutrient profile, they may have a number of health benefits (Kelebek *et al*., 2013). Raisins have a low to medium energy content and provide important minerals and dietary fiber, including fructo- oligosaccharides. Regular consumption of raisins, has been shown to improve glycemic control, reduce cardiovascular risk factors and have antioxidant activity.

The world's largest production of raisin (90 per cent) comes from Thompson Seedless (Williamson and Carughi, 2010). Currently in Maharashtra state about 90% raisins are made from Thompson Seedless and its clones including Manjari Kishmish (a mutant from Kishmish Rozavis) (Somkuwar *et al*., 2019). In addition to the other varieties viz. Muscat of Alexandria, Waltham Cross, Sonaka, Tas-A-Ganesh, 2A Clone, Manjari Kishmish were identified suitable for better quality raisin production under tropical conditionin India (Somkuwar *et al*., 2023). The type of raisin depends on the grape variety, color and size. The most common are dark raisins, which are usually prepared from Thompson Seedless grapes. Golden raisins (Muscat) are usually produced from white Muscat grapes. Sultana originates from yellow grapes without seeds and is usually sweeter and softer than other varieties. Zantecurrants, currants or corinth raisins are made from Black Corinth grapes and have a smaller size (Olmo-Cunillera *et al*., 2019). During drying, berries can be bleached by sulfuring (sulfur dioxide, SO_2) to keep the color stable and reduce mold formation and mycotoxin production (Skowron and Goslinska, 2020). Raisins, with their pleasing taste and aroma, enhance diet quality not just by delivering nutrition and physiological benefits, but also by providing rich phytochemicals like phenolics, prebiotics, tartaric acid and other minor components. This review paper describes the nutritional composition of raisin and their beneficial impact on human health.

Nutritional composition of raisin

According to the latest report of the United States Department of Agriculture, 100 g of raisins provide 299 kcal of energy, 59.19 g of sugars, 3.07 g of proteins, 0.46 g of lipids, 3.70 g of dietary fibers, 749 mg of potassium, 101 mg of phosphorus, 50 mg of calcium, 32 mg of magnesium, 11 mg of sodium, 1.88 mg of iron, 2.3 mg of vitamin B6, 0.17 mg of vitamin C, 0.12 mg of vitamin E as well as negligible amounts of phenolic compounds. In addition, on the basis of a 2000-calorie daily diet, only 40 g (1/4 cup) of raisins is required to provide 125 kcal of energy, and their consumption will meet the needs of the most essential nutrients (Khiari *et al*., 2019). In addition to its attractive appearance, delicious taste and excellent aroma, raisins, together with other dried fruits, are an important source of vitamins, minerals and other bioactive substances in the human diet (Jogaiah *et al*., 2014). It is well known that higher temperature for longer time during processing may affect the nutritional quality of dried fruits. Some of the nutritional elements depleted during drying while the other content will be increased. Dried fruits usually have a higher total energy, nutrient density and fiber content than fresh fruits (Fabani *et al*., 2017). Raisins are a good source of not only some essential nutrients - carbohydrates, especially fructose, glucose and key elements, such as iron, potassium, calcium and magnesium, but also phytochemicals, such as flavonols, quercetin and kaempferol glycosides, as well as phenolic acids, caftaric, and coutaric acid, which are essential for the growth and maintenance of the body (Somkuwar *et al*., 2023). New compounds, such as 2-S-glutathionylcaftaric acid and other oxidized cinnamic acids, as well as protocatechuic acid, have been found in sun dried and dipped raisins. However, drying process affects the final product—raisins.

Antioxidant properties of raisin

Oxidative stress increases in the body duringexercise, environmental pollution, diseases and smoking. Disruption of the balance between metabolic processes reduces the body's ability to remove free radicals and repair damages. A high positive correlation between the level of phenolics and antioxidant activity of food products was reported by Bennett *et al*. (2011). Antioxidants, including vitamins, minerals, copper, selenium and zinc, help to neutralize oxidation reactions (Salah *et al*., 1995). Raisins have a wide variety of varieties: a few are seedless, golden seedless, raisins with seeds, sultana, Zante currant, mixed species or varieties (Breksa *et al*., 2010). The antioxidant activity of raisin varies according to the processing method because phenolic compounds are affected by different processing methods. Raisin extracts can be used as antioxidants in food systems. The high phenolic content of raisins contributes to the antioxidant activity without adversely affecting sensory organs (Meng *et al*., 2011). Phenols, polyphenolics, and phenolic acid derivatives are the most common antioxidant compounds that are important for antioxidant activity. Flavonoids are also polyphenol compounds. Flavonoids, free-radical scavengers, and enzyme inhibitors have good antioxidant activity (Mishra *et al*., 2010; Mnari *et al*., 2016). Phenolic compounds are abundant in food materials. Phenolic acids and flavonoids present in raisin, such as benzoic and hydroxycinnamic acids, resveratrol, flavan-3-ols, catechin, and epicatechin and flavanols, such as kaempferol, quercetin, myricetin, and anthocyanins, are closely related

Table 1 : Nutritional composition of golden and dark raisin.

Nutrient	Golden Raisins	Dark Raisins	Units
Proximities			
Water	14.90	15.46	G
Energy	301	299	Kcal
Protein	3.28	3.30	G
Total lipid	0.20	0.25	G
Carbohydrate (by difference)	80.02	79.32	G
Fiber (total dietary)	3.30	4.50	G
Sugars (total)	65.70	65.18	G
Minerals			
Calcium	64	62	Mg
Iron	0.98	1.79	Mg
Magnesium	35	36	Mg
Phosphorus	101	98	Mg
Potassium	746	744	Mg
Sodium	24	26	Mg
Zinc	0.37	0.36	Mg
Vitamins			
Vitamin C (total ascorbic acid)	3.20	2.30	Mg
Thiamin	0.008	0.106	Mg
Riboflavin	0.191	0.125	Mg
Niacin	1.142	0.766	Mg
Vitamin B-6	0.323	0.174	Mg
Folate (DFE) [1]	3	5	µg
Vitamin B-12	0	0	µg
Vitamin A (RAE) [2]	0	0	µg
Vitamin A (IU) [3]	0	0	µg
Vitamin E (alpha-tocopherol)	0.12	0.12	Mg
Vitamin D (D2 + D3)	0	0	µg
Vitamin D	0	0	IU
Vitamin K (phylloquinone)	3.5	3.5	µg
Lipids			
Fatty acids (total saturated)	0.065	0.094	G
Fatty acids (total monounsaturated)	0.014	0.024	G
Fatty acids (total polyunsaturated)	0.057	0.053	G
Fatty acids (total *trans*)	0	0.001	G
Cholesterol	0	0	Mg

[1]**DFE** (dietary folate equivalents); [2]**RAE** (retinol activity equivalents); [3]**(IU)** International Unit.

to antioxidant activity (Zhao and Hall, 2007). Antioxidant properties of various parts of raisin are as follows; A) dry grape (raisin): The types of raisin, such as desert king, Muscat, red manaizi, wild redrose, blackcurrant and seedless are primarily screened for their phytochemical activity. Desert king has the highest content of phenolic compounds, which indicates its antioxidant capacity (Kelebek *et al*., 2013). Red manaizi and wild red rose also have higher phenolic content, indicating antioxidant activity. B) raisin seed: the seeds of raisins contain more lipids. Lipid peroxidation leads to deterioration of food products. The addition of antioxidants increases the shelf life. Synthetic antioxidant compounds, such as butylated hydroxy anisole (BHA) and butylated hydroxytoluene, are restricted in food preparation (Jayaprakasha *et al*., 2001). Therefore, there has been a significant increase in the search for natural antioxidants, especially plant-derived antioxidants. The seed extract contains

monomeric flavanols and procyanidin components that act with free radicals to form stable products and eliminate free radical chain reactions (Adam *et al*., 2016). Therefore, it may also contain effective antioxidant activity. C) Raisin oil : from raisin, the extracted oil has been examined, which shows the nature of lower-molecular-weight phenolic acids such as caffeic acid, epicatechin, gallic acid, and protocatechuic acid, which are found in the highest amount in raisin oil. Low-molecular-weight flavonoids, such as catechin and epicatechin, may have higher antioxidant activity, whereas high-molecular-weight flavonoids do not (Arts *et al*., 2000). Therefore, only flavonoids with lower molecular weights were found to have more antioxidant activity in the raisin oil extract. D) skin peel and juice: the peels of sultana varieties of raisins contain high amounts of reducing sugars and amino acids (Schuster *et al*., 2017). Raisin peels naturally contain phenolic compounds and thus have more antioxidant properties. The phenolic compounds which are in high quantity are procyanidins in skin (Zhao and Hall, 2007). Dry grape juice contains high amounts of phenolic compounds such as catechin, ferulic, p-coumaric, and caffeic acids. Phenolic compounds exhibit high antioxidant activity (Papadakis *et al*., 2006).

Health benefit of raisin consumption

Raisins present in the normal diet are believed to exert health-promoting properties. The usefulness of raisins as a source of beneficial compounds for the human diet is supported by a several of scientific studies. Most of the time, intervention studies that concentrate on diabetes, heart disease and dental health have evaluated the positive effects of raisins. A decrease in postprandial insulin response and modulation of sugar absorption (glycemic index) have been observed in both diabetic and healthy subjects. After a short-term consumption of approximately 70 g/day of raisin, a positive effect was noted compared with a similar quantity of snacks or glucose solution (Restani *et al*., 2016). Raisins may influence specific oxidative indicators and increase satiety by activating ghrelin and leptin, which may help regulate body weight. Nevertheless, the contribution of polyphenol, phenolic acid and tannin (PPT) components to these effects has not yet been clarified, and only a small number of research have been conducted. There is a need to determine the bioavailability and health effects of PPT component of raisin.

Diet is one of the main factors that contributes to maintaining good health. Different indexes have been proposed for assessing diet quality due to heterogeneous and multidisciplinary term. Several studies have reported a link between eating habits and healthy growth and development throughout childhood and adolescence, as well as the prevention and mitigation of health problems in adults. The Indian diet is a mainly focuses on the daily consumption of whole grains, oil, fruits, vegetables, legumes, nuts, herbs, spices. To recommend dietary guidelines and to evaluate the quality of the diet, knowledge and understanding of the composition of foods and their impact on human health is essential. Fulgoni *et al*. (2017) examined the association between the ingestion of raisins and raisin-containing foods with nutrient intake and dietary quality in children. The study reported that raisin consumers had significantly higher daily intakes of dietary fiber (22.9%), potassium (16%) and magnesium (11.6%) and lower intakes of added sugar (–19.1%), monounsaturated fat (–9.2%) and total fat (–5.1%) compared to non-consumers. Consumers eating of raisin or raisin containing foods exhibited better diet quality. Raisin is a high-energy food that contains more than 50% sugar. It appears to reduce food intake and appetite, probably due to its fiber content. Raisin contains nutrients that are necessary for functionality and metabolism.

It's interesting to note that some encouraging results for dental health were found. Because Raisins are considered to be important in the etiology of dental caries due to their high sugar content and stickiness. Three conditions are believed to promote the development of dental caries: (1) low oral pH, (2) food adhesion to the teeth, and (3) biofilm or bacterial behavior. When raisins are consumed alone, they (1) do not reduce the oral pH below 5.5 due to they contain low concentrations of sucrose, which would favor enamel demineralization, (2) do not remain on the teeth for too long, and (3) contain antioxidants with antibacterial activity. Raisins may also be beneficial for oral health because they contain antimicrobial phytochemicals that inhibit the growth of oral bacteria associated with dental diseases (Wong *et al*., 2013).

The glycemic index (GI) describes the blood glucose response after ingestion of a carbohydrate-containing test food relative to a carbohydrate-containing reference food, generally glucose or white bread (Venn and Green, 2007). The insulin index (II) is a direct index of the postprandial insulin response to a test food in comparison with an isoenergetic portion of a reference food (glucose or white bread) (Mirmiran *et al*., 2016). Foods are classified as low (55), medium (55–69), or high (>70) GI or II. Raisins have a low-to-moderate GI and II, which makes them a good choice for diabetic or insulin resistant patients. These indexes have been analysed by several researchers (Kim*et al*., 2008; Esfahani *et al*., 2014). Raisins are a

good choice both for diabetics and healthy individuals since they have low-to-moderate GI, thus their consumption lowers the glycemic and insulinemic responses. Moreover, they seem to reduce blood pressure in patients with type 2 diabetes (T2D), which is a risk factor for cardiovascular disease (CDV) (Olmo-Cunillera *et al*., 2019).

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels that are the first cause of death worldwide. The main risk factors for CVD include unhealthy diet, physical inactivity, tobacco and alcohol consumption. Dietary fiber and other phytochemicals increase cardiovascular (CV) health parameters by affecting lipoprotein metabolism and inflammation response. Due to their antioxidant and anti-inflammatory properties, phytochemicals, in particular phenolic compounds, can protect against atherosclerosis. The antioxidant activity of raisins was measured *in vitro* and *in vivo* (Spiller *et al*., 2002). Numerous studies suggest that consuming a diet high in antioxidant-rich foods, like polyphenols, may help prevent or treat atherosclerosis. Important cardiovascular disease risk indicators, including systolic pressure, total cholesterol, and low-density lipoprotein cholesterol, are lowered by raisins. Some studies have compared the effect of raisins on blood pressure with an isocaloric snack. Raisin significantly decreased systolic blood pressure in patients with type 2 diabetes mellitus, whereas diastolic pressure remained unchanged. Puglisi *et al.* (2008) reported a significant reduction in total and low-density lipoprotein cholesterol in all participants after 6 weeks. Barnes *et al*. measured the level of circulating oxidized low-density lipoprotein (LDL) during raisins-containing diet.Volunteers were randomly divided into three intervention groups receiving 56, 99 and 157 g of raisins per day for four weeks. The intake of 99 g/day of raisins substantially decreased the concentration of circulating oxidized LDL in blood after 4 weeks of intervention, whereas the circulating oxidized LDL level was reduced after 2 weeks of 157 g of raisins per day.

Conclusion

Now a day's consumer preference, consumption pattern and lifestyle are changes. The trend in consumer consumption toward a healthy, nutrient dense diet has increasing. However, raisin has attracted more and more attention because raisins have some of the polyphenolics content and antioxidant properties compared with traditional dried fruits and compare favorably with many other fruits as well. In spite of their high sugar content, raisins are a source of beneficial components and a healthy snack. Owing 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. Consumption of raisins reduces hunger and affects dietary intake by altering hormones that affect satiety, thereby reducing energy intake of meal, which may help to maintain a healthy body weight. Therefore, adding 80–90 g of raisins to the daily diet may be favorable for human health. Further studies should focus on raisin phytochemicals, specifically the minor ones and flavonoids other than flavonols, as well as the bioavailability of certain phytochemicals, particularly the absorption and metabolism of tartaric acid esters.

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