



### RAISIN - A NUTRITIOUS SNACK

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#### Abstract

Grape is one of the important fruit crop grown in India. Grapes are highly digestible and have a number of therapeutic properties. Most of the Grapes are processed into raisins and eaten all over the world. Raisins are highly nutritious food because of their sugar, mineral (especially iron), and vitamin (B and A) contents. The health benefits of raisins include relief from constipation, acidosis, anemia, fever, and sexual dysfunction. Raisins have also been known to help in attempts to gain weight in a healthy way, as well as for their positive impact on eye health, dental care, and bone quality.

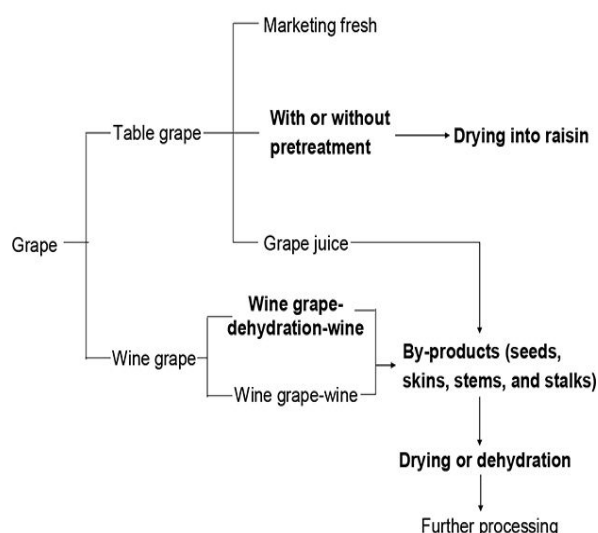
#### Introduction

Grape (*Vitis vinifera*) which belongs to *Vitaceae* family is one of the most important fruits consumed by human beings since ancient times. Grape is a nutritional fruit having glucose, fructose, sucrose, formic acid, citric acid, specially malic acid and tartaric acid. Commercial table grape cultivation in India is mainly restricted to tropical belt comprising Maharashtra, Karnataka, Tamil Nadu and Andhra Pradesh states (Post- harvest profile of grapes (2009)). About 94 per cent grape is cultivated in this belt. Other than these states few pockets of Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Madhya Pradesh and Mizoram are also growing grapes. The three most important species of grapes grown around the world are; European (*Vitis vinifera*), North American (*Vitis labrusca* and *vitis rotundifolia*) and French hybrids. Grapes are utilized as raw material mainly for preparation of raisins, wine making, ready to serve beverage, squash and juice concentrates. In India, grapes are mainly utilized for table purpose followed by preparation of raisins and wine making.

Raisins are dried grapes, commonly known as kishmish, bedana, manuka or dry fruit. They are sweet in taste & their sweet flavor is similar to the grapes from which they are made. Raisins are good source of nutritional elements like carbohydrates (sugars), folic acid and pantothenic acid, Vitamin B6 & minerals (calcium, magnesium, phosphorus, iron, copper, zinc etc.) and hence this fruit is considered a healthy snack. Raisins are eaten as choice food and used in many productions for flavor in bread, cake, sweets, and wine. Raisin is a popular dry fruit item with shelf life of around six months if stored properly. High concentration of sugars, low moisture contents as well as low pH makes them as naturally stable foods. For prolonged storage they are refrigerated in tightly sealed plastic bags. Apart from use as a dry fruit item, it is used in large quantities in many sweet preparations, baked food, farsan (snack) and desserts (ice-cream, shakes), (Yadav *et al.*, 2009). Grapes are either sun-dried or dehydrated mechanically, basic difference lies in the way of processing. They

are primarily prepared by sun drying of different varieties of grapes and are small, dark, wrinkled in appearance. In India, raisin is mostly produced in Sangli, Solapur and Nasik districts of Maharashtra and Bijapur district in Karnataka (Adsule *et al.*, 2012). Preservation of grapes in the form of raisins is a major profit-making business where grapes are grown.

Simply saying, a raisin is sun dried (Dried up to 80-85%) grape of certain varieties with a high content of sugar and solid flesh. Raisins are processed and eaten all over the world. Today Raisins have become a common part of daily diets, in many places raisins are bleached or dipped in oil to improve their appearance & taste. Raisins can be eaten out of hand, as well as used in variety of baked and cooked food. Raisins is the product prepared from the sound dried grapes of the varieties conforming to the characteristics of *Vitis vinifera* L. (but excluding currant types) processed in an appropriate manner into a form of marketable raisin with or without coating with suitable optional ingredients. Raisin is mostly produced from the varieties viz. Thompson Seedless and its clones like Manik Chaman. Besides, E 12/7, E 12/3, Mint Seedless and KR White are also proved to be promising varieties, (Ramos *et al.*, 2010).



Sanskrit	Draakshaa
English	Raisin
Hindi	Kishmish
Marathi	Kismis
Tamil	Trakshai
Telugu	Kissmiss
Malayalam	Kismis
Bengali	Kisamisa
Kannada	Onadraksi
Punjabi	Saugi
Gujarati	kisamisa

**Fig.1 Grape Processing into different value added products**

**Regional names of raisins** (*Spiceupcurry.com*, 2017)

### Characteristics of good Raisin (USDA Raisin standards)

The raisins of good quality should also have following characteristic features:

- i. Good and uniform appearance of produce in terms of its color (perfectly green or grey-green), size (round) and smooth texture
- ii. A higher pulp content and a pleasing taste without any sugar coat outside
- iii. Intact skin and its outer layers, free from injuries, dust and foreign matter.

### Global Raisin Production

USA, Turkey and South Africa are the largest raisin producers at the global level besides Greece, Australia, Iran, Afghanistan, China, Russia and others. India has achieved the raisin production level i.e. in the range of 55,000 to 65,000 tonnes next to Turkey at world level although there is no price stability for raisin production in last two years due to saturation of production. Efforts on improvement in quality of the Indian raisins vis-à-vis the imported of product is yet to be initiated for the export market by the Indian industry. As the

overall investment in raisin grape production is considerably less as compared to table grape production for export, hence the raisin exporters are expected to accrue better price realization out of this product in terms of superior cost: benefit ratio. India's export of raisins is 314 Mt with the value of 0.473 million US dollars.

**Important grape varieties for raisin making**

Major production of raisin (90%) in the world is from Thompson Seedless. The Thompson Seedless is a white, thin-skinned grape, which produces the best raisins available today. Its small berries are oval and elongated. It does not contain seeds and has high sugar content. Besides the other varieties viz. Muscat of Alexandria, Waltham Cross and other white and colored seeded varieties are also used for raisin production. In India, *Thompson Seedless* and its mutants i.e. *Sonaka*, *Tas-A-Ganesh*. *Manik Chaman* is mainly used for raisin production. NRC for Grapes, Pune, screened a sizeable germplasm for production of quality raisin production and identified some varieties viz. A 17-3, E 12/3, Mint Seedless, Superior Seedless, KR White, Manik Chaman, A18-3 (Colored seedless) and Cardinal (for manukka) for this purpose.

**Table 1. Nutritional Proximate of Raisins (Per100 g)** (USDA National Nutrient Database for Standard Reference, 2016)

Component	Value
Water	14.97 g
Energy	302 Kcal
Protein	3.39 g
Total lipid (fat)	0.46 g
Carbohydrate, by difference	79.52 g
Fiber, total dietary	4.0 g
Sugars, total	59.19 g
Calcium, Ca	53 mg
Iron, Fe	1.79 mg
Magnesium, Mg	35 mg
Phosphorus, P	115 mg
Potassium, K	746 mg
Sodium, Na	12 mg
Vitamin C, total ascorbic acid	3.2 mg
Riboflavin	0.191 mg
Niacin	1.142 mg
Vitamin B-6	0.323 mg

**Table 2. Nutrient proximate of Thompson seedless raw:** (USDA National Nutrient Database for Standard Reference,

Component	Value
Water	80.54 g
Energy	69 Kcal
Protein	0.72 g
Total lipid (fat)	0.16 g
Carbohydrate, by difference	18.10 g
Fiber, total dietary	0.9 g
Sugars, total	15.48 g
Calcium, Ca	10 mg
Iron, Fe	0.36 mg
Magnesium, Mg	7 mg
Phosphorus, P	20 mg
Potassium, K	191 mg
Sodium, Na	2 mg
Zinc, Zn	0.07 mg
Vitamin C, total ascorbic acid	3.2 mg
Thiamin	0.069 mg
Riboflavin	0.070mg
Niacin	0.188 mg
Vitamin B-6	0.086 mg
Vitamin A, IU	66 IU
Vitamin E (alpha-tocopherol)	0.19 mg

**Drying process**

Drying, which is the oldest of food preservation practiced by mankind, and is the most important process to preserve fruits and vegetables because it has a great effect on the quality of the dried products. The major objective in drying products is the reduction of the moisture content to a level that allows safe storage over an extended period. It is an obligation to apply modern technology and production methods to the drying processes

in order to obtain hygienic and good-quality dried products

Drying process has to be selective to remove the water from berry without affecting outer skin structure and arrangement of wax plates. The quality of waxy layers in terms of wax plates is about 0.1 mg/cm<sup>2</sup>. This layer only protects the berries from getting dried in fresh form. During storage of berries at ambient and low temperature, the water moves out from the stalk and rachis and not from the skin coated with white waxy layer and this result in drying of pedicels and berry drop. Waxy layer on the green berry skin is the main target of various pretreatment of berries for quickening the drying process. Many treatments have been worked out in different countries after various research trials and an appropriate and economic treatment have been listed below for drying of grapes.

Dipping of grape bunches in solution of ethyl oleate (1.5%) and potassium carbonate (2.5%) for 2- 4 minutes is common practice followed for raisin making. The grape drying process completed is within 10-15 days. The grape drying sheds established in the identified areas where higher temperature (ranged between 35-40 °C) coupled with good wind velocity and low humidity during grape drying season. To avoid the exposure of grapes to sun light during drying process, placing of curtains on the sun facing side is the common feature of raisin sheds. The single layer of pretreated grape bunches spread on the mesh. The position of bunches changed (up and down) by hands everyday to give the better exposure of dried air temperature to all berries.

The technique of raisin production in India is mostly based on the dipping of the berries in Australian dip emulsion, which contains 2.4% potassium carbonate and 1.5% ethyl oleate and subsequent drying in shade in open tier system. The place, Junoni, in Sangola taluka of Solapur district in Maharashtra has been selected for the establishment and promotion of grape drying units on large scale based on its appropriate geological and weather data and proved the place most suitable in terms of latitude, longitude, rainfall, temperature, humidity, air velocity, etc. for drying the grape in natural way. “Junoni” a barren land is presently leading the raisin activities in the country and has now turned into industrial urban town.

### **(1) Color Changes during Drying**

Browning is caused by *enzymatic* and *non-enzymatic* browning reactions initiated through cell breakdown from cell dehydration. The predominant enzymatic browning occurs when polyphenol oxidase (PPO) comes into contact with phenolic compounds (principally caftaric acid in grapes) when cell integrity is lost. Polyphenol oxidase is a generic term for the group of enzymes that catalyze the oxidation of phenolic compounds to produce brown color in exposed or disrupted plant tissues. The brown color results from the formation of quinones, which undergo oxidative polymerization to produce brown-black melanin pigments. Oxygen (O<sub>2</sub>) and water must be present if the reaction is to take place. Most of the PPO activity is found in plastids, including chloroplasts, in the skin and in the seeds or seed traces. Thus, browning begins at the periphery and centre of the berry, but rapidly progresses throughout the pulp as the substances come into contact with one another. Non-enzymatic browning, known as the *Maillard reaction*, is a much slower process caused by a reaction of reducing sugars with protein amino groups, (Mrak, 1938).

(2) **Influence of Drying Conditions** Browning is increased with higher temperatures and slower drying; rapid drying at cooler temperatures concentrates sugars that inhibit PPO activity and tends to maintain more cellular integrity. Thus the relatively slow field tray-drying of un-dipped fruit at high temperatures produces the dark colored *natural* raisin. Conversely, raisin industries elsewhere, as in Australia, strive for uniformly light colored raisins for their 'Sultana' market. Light coloration is optimized by cold dipping to speed drying and rack drying at ambient air temperatures. Some 'Sultanas' retain an objectionable green tinge after drying. The problem is greatest with low-maturity fruit and clusters that ripen in a shaded part of the canopy, thus retaining more chlorophyll. Emulsion-dipped fruit dried in the shade also tends to retain more chlorophyll and thus green color. Fruit dried in the dark remain even more green and lighter in color than shade-dried fruit. *Green naturals* produced in Afghanistan and China retain much of their original green-golden color due to the tradition of drying in dark, vented drying houses. (Fadhel *et al.*, 2005)

### **Quality and food safety of Indian raisins**

The quality of dried grapes as a semi-processed product and raisin (the final product) are evaluated in terms of the appearance, texture, free-flow (having non-sticky surface), cleanliness (for dried grapes that easily could be processed with minimum damage), flavor, and nutritional value. Apart from varieties and pre-harvest conditions, the quality of dried grapes/raisins largely depends on operating, pre-treatment, drying, processing, and storage conditions. The quality of different varieties of grapes after drying in similar operating conditions has not been identical due to differences in texture and composition. Fruit maturity has a direct influence on the appearance, texture, flavor and food value so that raisins produced from low-maturity fruit are skinny, coarse wrinkled, hard, light in weight, and tend toward a lighter white and reddish color. The texture of fruit is also influenced by pre-harvest factors such as environmental, cultural, physiological, and genetic factors. (Barbulescu *et al.*, 1988)

Both color and texture greatly influence the marketability of the product. Indian raisins are complying codex standards and are free from pesticide residues. As per study results, raisins were free from contamination of lead or arsenic. No traces of mineral oil could be detected. The raisins were free from any food/industrial grade synthetic colour also (Adsule and Banerjee 2003). In this study, it was found that Indian raisins by and large comply to all the physico-chemical, microbiological and organoleptic parameters and food safety standards specified by Codex Alimentarius Commission except for a few physical parameters like number of cap stems and stem pieces in unit quantity The Indian raisins are very rich in phytochemicals (Senadeera *et al.*, 2014).

### **Benefits of Raisins**

The health benefits of raisins include relief from constipation, acidosis, anemia, fever, and sexual dysfunction. Raisins have also been known to help in attempts to gain weight in a healthy way, as well as for their positive impact on eye health, dental care, and bone quality. Raisins are irreplaceable as they are a healthy member of the dry fruits category. These golden, green and black delicacies are favorites of everyone, particularly children. They are widely used in cultural cooking around the world (especially in desserts) and are also added to health tonics, snacks, and compact, high-energy food supplements for mountaineers,

backpackers, and campers. Raisins are obtained by drying grapes, either in the sun or in driers, which turns the grapes into golden, green or black gems, (Ghasemzade *et al.*, 2008).

### **Medicinal Importance of raisins**

When the nutritional values and health benefits of raisins are considered, “gems” is an accurate name for them.

#### **1. Relieve Constipation**

When ingested, raisins swell because the fiber present in them shrinks in a dried form, but begins to swell due to the natural fluids. This adds bulk to the food moving through the intestinal tract and ultimately helps provide relief from constipation. The type of fiber in raisins is considered insoluble fiber because it takes in water and gains volume in that way. Besides reducing constipation, they can also help to stop loose stools, again by absorbing its liquid and reducing the frequency and unpredictability of diarrhoea.

#### **2. Promote Weight Gain**

Raisins, like all dried fruits, are very good tools for gaining weight in a healthy way since they are full of fructose and glucose and contain a lot of potential energy. They form an ideal part of a diet for athletes or body builders who need a powerful boost of energy, or for those who want to put on weight without accumulating unhealthy amounts of cholesterol. Their role as an addition to the diet is because of the vitamins, amino acids, and minerals, such as selenium and phosphorus, which facilitate absorption of other nutrients and proteins in the body. Raisins also stimulate the efficient absorption of other proteins, vitamins, and nutrients gained from food, which improves your overall energy and immune system strength.

#### **3. Prevent Cancer**

Raisins have high levels of catechins, which are polyphenolic antioxidants in the blood. Antioxidants scavenge the free radicals that float around the body and wreak havoc on the organ systems and cells. Free radicals are one of the primary, underlying factors that lead to the spontaneous growth of cancer cells, as well as the substance that can spur on metastasis. Therefore, by including raisins in your diet and increasing the level of these powerful antioxidants in your system, you can prevent cancer, or slow down its progress if you have already developed it.

#### **4. Reduce Hypertension**

For many years, some people have believed that raisins have the power to reduce blood pressure and protect the integrity of heart health, but it was only recently that experts began intensive studies on these claims. The findings, although still not absolutely definitive on how raisins reduced blood pressure, did show a positive correlation between reduced hypertension and consumption of raisins. Many of the nutrients packed into raisins are beneficial, but experts believe that it is the high level of potassium that helps. Potassium is a well-researched way to reduce the tension of blood vessels and decrease blood pressure, and the dietary fiber in raisins is also thought to affect the biochemistry of blood vessels and reduce their stiffness, which in turn reduces hypertension.

#### **5. Control Diabetes**

In a number of studies, raisins have been shown to lower the postprandial insulin response, which means that after eating a meal, they can help the spikes or plunges in insulin levels that can be dangerous to patients with diabetes. It modulates the sugar absorption by the body,

making it more even and stable by reducing the chance of health complications or emergencies for those suffering from both the types of diabetes. They also help to regulate the release of leptin and ghrelin, which are the hormones responsible for telling the body when it is hungry or full. By keeping these hormones in check, people who eat raisins can improve their chances of maintaining a healthy diet and prevent overeating.

#### **6. Prevent Acidosis**

Acidosis is a state of increased acidity of the blood (also known as toxicity of the blood) or the gases in our respiratory system. This increased acidity can be very harmful to the body as it may lead to a number of health problems such as boils, skin disease and damage to the internal organs, arthritis, gout, renal calculi, hair loss, heart diseases, tumors and even cancer. Raisins are a good source of potassium and magnesium, which are two of the most common components of antacids because they are considered based on the pH scale.

#### **7. Sexual Dysfunction**

Raisins have long been known to stimulate the libido and induce arousal, primarily due to the presence of an amino acid called Arginine, which is beneficial in treating erectile dysfunctions. Arginine also increases the levels of sperm motility, which can increase the chances of conception when engaging in sexual intercourse.

#### **8. Promote Bone Health**

Calcium, which is the main element of our bones, is present in raisins, and these dried fruits are one of the best sources of Boron, a micronutrient. For those of you who don't know, a micronutrient is a nutrient required by the body in very small amount as compared to other nutrients that must be consumed daily in significant amounts. Boron is vital for proper bone formation and efficient absorption of calcium. It is particularly helpful in preventing osteoporosis induced by menopause in women and has been very beneficial for bones and joints. Potassium is another essential nutrient found in high levels in raisins which can help strengthen bones and promote bone growth, thereby reducing the chances of osteoporosis in people.

#### **9. Dental Care**

Oleanolic Acid, one of the phytochemicals present in raisins, plays a crucial role in protecting your teeth against tooth decay, cavities, and teeth brittleness. It effectively prevents the growth of *Streptococcus Mutans* and *Porphyromonas Gingivalis*, two of the bacterial species that are most responsible for cavities and other dental problems. In addition, it is rich in calcium which is good for promoting dental health, as it prevents breaking or peeling away of teeth and enamel while making them stronger.

As strange as it may sound, when eating raisins, the longer they stick to your teeth, the better, because that ensures an extended contact of Oleanolic Acid with the teeth, increasing the preventative powers of bacterial growth. In addition, its role in bone health and osteoporosis treatment, the boron present in raisins plays a very important role in curbing the growth of oral germs as well as in promoting strong teeth,

#### **Other Benefits**

The fibers in raisins also help promote excretion of bile from the body, and it stimulates the burning of cholesterol, thereby promoting good cardiac health. Furthermore, the amount of fiber in them helps to sweep out the toxins and harmful materials in the

digestive tract, which can protect people from additional intestinal diseases, and bacterial growth that is eliminated when the toxins are swept out.

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