



A Review on *Vitis vinifera* L.: The Grape

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ABSTRACT

Vitis vinifera, the Grape being a common fruit with great nutritional values, has been known to mankind since ancient times. *Vitis vinifera* is a renowned species of grape with a number of varieties originated from western Asia and southern Europe. *Vitis vinifera* is the Latin name applied to grapevines. It is a vigorous, high-powered tendril climber with a large, lobed, bright green leaves. The tiny green summer flowers are followed by late summer bunches of small grapes. The fruit is used as food supplement and the seeds and leaves are employed in herbal therapy. The most significant application of grape is in wine production followed by raisin and juice. Thus, grape is also an economically important fruit crop in the world. Several varieties of *Vitis vinifera* are available in India. Phytochemistry, pharmacological, nutraceutical, traditional uses of *Vitis vinifera* are been presented in this review. The nutritional and phytochemical constituents present in the grape have resulted in its health beneficial effects however more studies are needed regarding the genotoxicity and toxicity of *Vitis vinifera*.

Keywords: Flavonoids, Grape, Pharmacological actions, *Vitis vinifera*.

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INTRODUCTION

Vitis vinifera L. commonly known as grape, belongs to the family Vitaceae. Grape is one of the largest commodities in agriculture. The grape farming is called as viticulture. Around 10,000 varieties of grape are there in this world. The varieties include seedless, non-seedless and also come in white, red, green colors. *Vitis vinifera* species dominate the other species of grape by 90%¹. Grapes have been used for thousand years because of their nutritional and medicinal benefits. These are rich in sugars, flavonoids, anthocyanin and proanthocyanins, organic acids, tannin, mineral salts and vitamins².

Grapes have been used traditionally in Pakistan, Italy and Turkey as laxatives, carminatives and as drug therapy for cold, flu, anaemia, wound care, allergies and bronchitis. Researches has proven that the bioactive compounds present in grapes has led to the pharmacological activities such as antioxidant, antidiabetic, anticancer, anti-inflammatory, anti-acne, anti-aging, antiplatelet, anti-asthma, anti-obesity and anti-sunburn and wound healing properties¹.

Vernacular Names³

Table 1: Vernacular names of *Vitis vinifera*

English	Grape
Sanskrit	Draksha
Hindi	Angur
Kannada	Drakshi
Malayalam	Mundari
Ayurvedic	Draakshaa
Unani	Angoor

Taxonomical Classification

Table 2: Taxonomical classification of *Vitis vinifera*

Kingdom	Plantae
Subkingdom	Tracheophytes
Super division	Angiosperms
Division	Eudicots
Class	Rosids
Order	Vitales
Family	Vitaceae
Genus	Vitis
Species	vinifera

Botanical Description

Vitis vinifera L perennial, woody climbing vine; stems up to 35m long, but in cultivation usually reduced by annual pruning to 1-3m; leaves thin, circular to circular-ovate, 5-23 cm broad, margins dentate or jagged, basal sinus deep



and lobes often overlapping, 5-7-lobed, glabrescent above, often with persistent tomentum beneath; tendrils branched, normally opposite 2 leaves out of three; flowers numerous, in dense panicles or thyrses opposite leaves.

Flower: clusters and tendrils absent at every third node; calyx very shortly 5-lobed; petals about 5mm, pale green, sweet-scented; fruit a soft, pulpy berry, skin adhering to pulp, oval or oblong, ellipsoid to globose, skin green, yellow, red or purplish-black, in large, long clusters; seeds 2-3, sometimes none, pyriform, with rather long beak².

Distribution

Grapes are distributed almost all over the world. They are found in China, India, Iran, Egypt, Turkey, Brazil, Mexico, Central and Southern Europe, Western Asia Such as Anatolia, Caucasus, Middle East, China, Africa, Northern Mediterranean Coast, South Africa, North Africa, California, Michigan, New Mexico, New York, Oregon, Washington State, British Columbia, Ontario, Quebec, Chile, Argentina, Uruguay, Peru. The most wine produced in Germany, France, Italy, Canada, USA, New Zealand. The countries that are popular for raisin production are Iran, Turkey, India, USA. In India different types of grapes are grown such as Thompson seedless, Anab-e-Shahi, Dilkush, Bangalore blue etc⁴.

Active Constituents

According to the recent studies, the consumption of grape and grape products has shown the beneficial health effects which is attributed by the unique mix of polyphenolic compounds⁵.

Fruit: A good source of bio flavonoids (Vitamin P), malic acid and tannic acid; dehydroascorbic acid, cholesterol, ergosterol and beta-sitosterol.

Flavonoids: Grape seeds contain flavonoids (4ñ 5%), including kaempferol-3-O-glucosides, quercetin- 3-O-glucosides, quercetin and myricetin.

Polyphenols: Grapes are rich in polyphenols and about 60-70% of grape polyphenols are present in grape seeds.

The grape polyphenols are Flavon-3-ol derivatives. The major components are (+)-catechins, (-)-epicatechins, (-)-epicatechin-3-o-gallate, procyanidins dimer (B1, B5), procyanidin C1, procyanidin B5 – 32-gallate.

Grape seeds also contain procyanidins and proanthocyanidins. These are esters of gallic acid.

However, monomers of (+)-catechin, (-)- epicatechin, (-)-epicatechin-3-O-gallate are also reported to be present.

Anthocyanins: The anthocyanins that have been reported for *V. Vinifera* include 3- glucosides, 3- acetylglucosides, 3-coumaroylglucosides, 3- caffeoyl glucosides, 3,5- diglucosides, 3-acetyl-5- diglucosides, 3-coumaroyl-5- diglucosides, and 3- caffeoyl-5- diglucosides of cyanidin, delphinidin, peonidin, petunidin, and malvidin.

Stilbene derivatives: Trans-Resveratrol (trans- 3,5,4,0-trihydroxystilbene) has also been reported in grapes².

Pharmacological Activities

Anti-inflammatory action

The studies have shown that the grape polyphenols decrease the chronic inflammation by modifying the inflammatory pathways or by reducing the ROS levels. Flavonoids and proanthocyanidins present in grapes target multiple pathways to overcome chronic inflammation thus proven to be more effective than the synthetic mono-targeted anti-inflammatory drugs^{5,6}. Proanthocyanidins extracted from grape seeds found to have immunomodulatory role in inflammatory condition caused by overproduction of nitric oxide and prostaglandin E2⁷.

Anti-oxidant activities

The consumption of dietary flavonoids extracted from the grape in the form of grape extract and grape seed powder have shown to be effective in suppressing the oxidative stress and preventing the oxidative damage in vivo. These activities of grape are attributed by the functions of grape flavonoids as free radical scavengers and metal chelating compounds⁵.

Anti-microbial activity

The plant polyphenols have demonstrated to have activities such as antimicrobial, antifungal and antiviral. The different parts of *Vitis vinifera* with phenolic compounds showed different anti-microbial properties. According to the researches the grape seed extracts are more anti-microbial than the other parts of the grapes. The increasing order of grape anti-microbial activity is from flesh, whole fruit grape extract, fermented pomace, skin, leaves and seed⁸.

Resveratrol, a phenolic compound in grape have shown to possess antifungal activity against the human pathogenic fungi *Candida albicans* and the notable benefit of polyphenols against the chemical derived drug was that there was no induction of haemolytic activity on human erythrocytes. Thus, the observed anti-fungal activity of grapes has been attributed to their commercial applications and are being incorporated into the skincare cosmetics^{5,8}.

Hepatoprotective activity

The polyphenols present in the grape has led to hepatoprotective activity due to their anti-inflammatory and antioxidant properties⁹. It was found that the polyphenol rich grape skin extract improved liver steatosis and protective against diet induced adiposity and hepatic steatosis. The effect is probably because of the suppression of lipogenic enzymes in liver and adipose tissues and modulation of lipid metabolism by regulation of mRNA expression of enzymes, involved in regulation of lipogenesis and fatty acids oxidation¹⁰.



Cardiovascular benefits

Numerous researches suggested that the daily intake of grape and/or grape products might protect the cardiovascular health. This protective activity is due to enhanced vascular and endothelial function, decreased oxidation of low-density lipoprotein (LDL), positive alteration in blood lipid concentrations and modulating inflammatory process^{9,11}.

Anti-cancer activity

Some studies suggest that the consumption of grape components could be associated with reduced risk of certain cancers such as colon cancer, breast cancer etc. Grape antioxidants play a major role in their anticancer activity because of their antioxidant, anti-inflammatory and anti-proliferative properties. Antioxidants present in the grape have shown to induce cell cycle arrest and apoptosis in the cancer cells and also prevents carcinogenesis and cancer progression in study models. The mechanism of anti-cancer action is due their effect on multiple cellular events associated with tumour initiation, promotion and progression¹².

Anti-obesity and anti-diabetic activity

Polyphenols present in the grape and grape products are suggested to be effective in reducing the metabolic syndrome and preventing the obesity and type 2 diabetes by their action as multi-target modulators with anti-oxidant and anti-inflammatory effects⁵.

Dermatological effects

Polyphenols present in the red grape seed extract was found to be having protective effect against multiple doses of UV-B irradiation and also showed enhanced anti-oxidant activity against UV-B irradiation and also inhibits apoptosis due to irradiation to certain extent. Thus, grape extract can be used as a portion in sunscreen⁹.

Grape as nutraceuticals

Wine being a most widely popular as well as nutritional grape product has been proven to be having beneficial health effects on the human body. The consumption of red wine in moderate amount in daily diet considered to contribute to the consumers health mainly because of their composition of quercetin and resveratrol. However, since alcohol is also its composition its mass consumption is restricted¹³.

Unique combination of active constituents in grape like polyphenols, flavonoids, anthocyanins, proanthocyanins, stilbenes, has resulted in development of novel nutraceutical products. There are wide range of food additives and nutraceutical products originating from grape in the worldwide market. Some of the examples for commercialized products are grape skin extract, seed extract, grape skin powder, dry seed powder, pomace powder, anthocyanin colorants etc⁵.

Anti-aging activity

Pollution and radiation cause the aging of skin. According to some researches grape seed extract could slow the onset of skin aging or may also work by increasing the skin elasticity because of its resveratrol content and also because of its richness in anti-oxidants, thus making it a potential ingredient in anti-aging products¹.

Anti-acne activity

The most common skin problem, acne vulgaris is caused by *Propionibacterium acnes*. Based on some researches the grape leaves extract was found to have anti-acne activity against *P. acnes*¹⁴.

Traditional uses of *Vitis vinifera*

Fruits of *Vitis vinifera* is been in use since ancient times for its nutritional benefits and as food. The ripe fruit is been used traditionally as laxative, purgative, fattening, diuretic, aphrodisiac, appetizer and was also used as a remedy for asthma, jaundice, strangury and some blood diseases. The ashes of stem are used as pain reliver for joint pain, swelling of testicles and for piles. The flowers of grapes are been used as expectorant, haematinic and also useful for bronchitis. In Iran, leaves of *Vitis vinifera* are used in traditional food and also for the treatment of diarrhoea and bleeding. Sap of the young branches of grapes are used as remedy for skin diseases. Dried fruits are in as demulcent, cooling, sweet, laxative, stomachic, used in thirst, heat of body, cough. In folk remedy, the malagma of seed is been used for condylomata of joints. Juice of grape prepared in various manners are been used traditionally to treat various tumours².

CONCLUSION

Grape and grape-products should be promoted in our daily diet, not only as a healthy food but also as a nutrient because of its varied health beneficial constituents. A number of studies have strongly suggested the inclusion of grape and grape-products as a health-supplement in the daily diet for its significant health benefits. Even though Grape has been in use since ancient times in folk medicine as a remedy for several disease conditions, yet it hasn't been clearly documented. A thorough study needs to be conducted to prove its significance. Active constituents present in grapes have resulted in its potential pharmacological activities but further research has to be carried out to evaluate other possible health and toxic effects.

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