

Review Article**A REVIEW ON PHARMACOLOGICAL ACTIVITIES OF (*HYBRID PERENTAGE*) -*****MALUS DOMESTICA M. SYLVESTRIS (GREEN APPLE)*****Rohith kharvi K^{1*}, Satish S² and AR Shabaraya²**

¹Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Post-Farangipete, Mangalore - 574143, Karnataka, India.

²Department of Pharmaceutics, Srinivas College of Pharmacy, Valachil, Post-Farangipete, Mangalore - 574143, Karnataka, India.

ABSTRACT

Green apples are as healthy as the red ones. However, they are a little **sour** and sweet in taste. **Green apples** have a lot of health and beauty benefits to offer. They are packed with nutrients, fiber, minerals and vitamins that are good for the overall health. The apple is an excellent dentifrice, Green apple apple is one of high in antioxidant activity. Used in the treatment of Obesity, ulcer, haemorrhoid, diarrhoea, dysentery, piles, colic, inflammations, rashes, burns, rheumatic pains and bowel complaints. antimicrobial, emollient. Green apples can help prevent diarrhoea as well as constipation and gout. The mechanical action of eating a fruit serving to clean both the teeth and the gums. It is used in prevention of Cancer, weight loss, cardiovascular disease, diabetes, asthma, alzheimer's and Parkinson, blood sugar regulation, boost immunity, anaemia, Rheumatism.

Keywords: *Granny smith apple*, Anti-oxidant, cancer, cardiovascular disease, phenolics, flavonoids, fruit.

INTRODUCTION

In India it is mostly grown in Kashmir, hills of Uttar Pradesh, Himachal Pradesh. Apple cultivation also extended to Nagaland, Sikkim, Arunachal Pradesh, and Meghalaya. A major class of phytochemicals found commonly in fruits are the flavonoids. Green Apples are a very significant source of flavonoids. Green Apples were one of the main sources of dietary flavonoids that showed the strongest associations with decreased mortality.¹

Not only are apples commonly enjoyed by many cultures, but they are also a good source of antioxidants. When compared to many other commonly consumed fruits in the United States, apples had the second highest level of antioxidant activity . Apples also ranked the second for total concentration of phenolic compounds, and perhaps more importantly, apples had the highest portion of free phenolics when compared to other fruits. This means that these compounds are not bound to other compounds in the fruits, and the phenolics may be more available for eventual absorption into the bloodstream.²

Family: Rosaceae

Synonyms: Granny smith apple ,crispin apple ,

Common names: Green apple , Seb (Hindi), Seva (Sanskrit), Sebu (Kannada)

Distribution:

Green apple The 'Granny Smith' cultivar originated in Eastwood, New South Wales, Australia (now a suburb of Sydney) in 1868. Granny Smith apples are light green in colour. They are popularly used in many apple dishes, such as apple pie, apple cobbler, apple crumble, and apple cake.

Part used: fruits

Maturity Season: Late Season, mid to late October in BC. with Braeburn, often picked earlier. "The time to pick is when the price is right".

Harvest Criteria: Based on starch conversion, taste and market availability.

Fruit Description: Medium to large in size, round in shape. Taste is distinctively tart with some sweetness. Skin color green with conspicuous white lenticels. The white flesh is firm, crisp and juicy.

Tree Description: Vigorous, slightly weeping in habit, and precocious. Has a tendency to tip bear.

Production: Very productive.

Strains: Regular Granny Smith is the only strain worth planting. Spur type Granny's are very inferior in fruit quality.

Advantages: Unique taste has a consumer following. World class apple. Good storage

potential. Consumer acceptance has allowed Granny to maintain its market and returns

Disadvantages: Can have a very long growing season. Fruit can exhibit, sunscald, and watercore. Fruit with pink/red blush may be undesirable in the market place. Moderately susceptible to apple scab, powdery mildew and fireblight.

Storage: Good with very good CA potential and long shelf life. Storage scald may develop if picked too early.

Planting Trends: The world market for green apples is stable.



(HYBRID PERENTAGE)- *MALUS Domestica M. Sylvestris* (Green apple) fruit

CHEMICAL CONSTITUENTS

Green Apple contains a large concentration of flavonoids, as well as a variety of other phytochemicals, and the concentration of these phytochemicals may depend on many factors, such as cultivar of the apple, harvest and storage of the apples, and processing of the apples. Concentration of phytochemicals also varies greatly between the apple peels and the apple flesh. Vitamin C in apples contributes less than 0.4% of the total antioxidant activity.

Active constituent of Green apple fruit

Apple, raw, with skin

Carbohydrates (1g), Sugars (30pg),

Minerals Calcium (6mg),Magnesium(5mg), Phosphorus (11mg), Potassium(107mg),

Vitamins Thiamines B₁ (0.017mg),Niacin B₃ (0.1mg), Pantothenic acid B₄ (1mg), Folate B₉ (3μg)

THERAPEUTIC USES³

High Fibre Content: It contains a lot of fiber, which helps clean the system and increases metabolism. This, therefore, helps in free bowel movement. It is always advisable to eat an apple with its skin on. The cleaner intestine and systems are the happier and healthier.

Mineral Content: It contains, a number of minerals – iron, zinc, copper, manganese, potassium, etc. which are trace minerals and are a must for human health and well-being.

The iron in apples is a trace element and it helps in raising the levels of blood oxygen and helps in increased metabolic rate.

Low in Fat Content: This is a great food when it comes to weight watchers. People on diet and/or are regular gym goers should and must include one apple in their every day diet. It also collects the fats in the blood vessels and helps in maintaining proper blood flow to the heart preventing the chances of strokes.

Prevents Skin Cancer: It contains Vitamin C that helps in preventing skin cells damage by free radicals and thus reduces the chances of skin cancer. Rich In Anti-Oxidants, anti-inflammatory: It contains anti-oxidants which help in cell re-building and cell rejuvenation. This also helps in maintaining healthy and glowing skin. The antioxidants also protect liver and ensure its proper functioning. Green apple juice, as mentioned above, contains a good dose of antioxidants. These antioxidants actually help in safeguarding your body from oxidative stress-induced painful inflammatory conditions, such as rheumatism and arthritis. **Asthma:** Studies suggest that regular use of green apple juice can cut down the risk associated with the onset of asthma. People who are regular smokers can also rely on this fresh delight to safeguard themselves from obstructive pulmonary diseases.

Vision: Green apple juice is a source of various vitamins. The Vitamin A present in this juice is known to possess the potential to strengthen and improve your vision.

Blood Clotting: This green juice is a potential source of Vitamin K, the element that helps the blood to coagulate and clot . People who drink this juice possess a better wound repairing and healing potential. Women, who have extremely heavy periods, can also use this drink to bring the bleeding under control.

Healthy Strong Bones: Green apple juice has a rich presence of calcium, which is essential for strengthening the bones and teeth and keeping them healthy . Women, especially, in their menopause, should include this drink in their diet to prevent osteoporosis.

Skin Benefits: Green apple is an excellent beauty enhancer. Lots of skin care and hair care benefits are associated with green apples.

Anti-Aging Ingredient: The antioxidants, such as Vitamin C, and phenols present in green apple juice play a major in delaying premature aging. Free radicals present in the body cause

the early onset of wrinkles, fine lines, and dark spots. Regular use of this antioxidant rich drink can help the body fight these free radicals and control or even better, eliminate the damages.

Improves Skin Texture: A face mask involving the use of green apple can deeply moisturize your skin and help to eliminate the appearance of wrinkles while improving the overall texture of your skin. You can take the help of green apple juice to improve the hydration levels of your skin. It can either be consumed or even be used as a face wash to prevent the skin from drying out.

Nourishes the Skin: Owing to its dense vitamin content, green apple helps in maintaining your skin and has great whitening and nourishing effects on your complexion. Packed with assorted vitamins and minerals, you can incorporate this drink into your skin care regimen. The collagen and elastin proteins get a boost, which in turn, improves your complexion by nourishing and healing the skin from deep within.

Prevents Skin Diseases: Many a time, lack of nourishment leaves the skin at the risk of various skin disorders, including eczema and cancer. Green apple juice ensures that the skin gets the necessary levels of nourishment. It also offers protection from various skin issues.

Controls & Prevents Pimple Eruptions: Green apple is a highly effective anti-acne treatment as well. Regular consumption of green apple help you control and prevent pimple eruptions.

Eliminates Dark Eye Circles: The deep brown circles along with puffiness around your eyes are signs of your skin getting older. Topical application of fresh apple juice as well as internal consumption is known to have a positive impact on these undesirable changes.

Hair Benefits Of Green Apples: Green apple is not only good for our skin but for our hair as well. Here we have a few of the benefits of green apples for your hair listed for you.

Cures Dandruff: A paste created with the leaves and skin of green apple works wonders to fix dandruff. You should use this paste as a shampoo. Green apple juice also has the same effects if massaged regularly onto the scalp.

Enhances Hair Growth: Packed with a tempting array of vitamins and minerals, green apple juice is a potential natural remedy for strengthening your tresses. Along with that, it also makes sure that your hair fall is under control. Plus, regular use of this juice is also known to promote hair growth. In short, using green apple juice could help you show off long, strong, and lush hair.

Infusion of teaspoon of dry flower and leaves to reduce blood pressure in case of hypertension due to it contains vasodilator value of histidine.

PHARMACOLOGICAL ACTIVITIES

1. CANCER

Several studies have specifically linked apple consumption with a reduced risk for cancer, especially lung cancer. In the Nurses' Health Study and the Health Professionals' Follow-up Study, involving over 77,000 women and 47,000 men, fruit and vegetable intake was associated with a 21% reduced risk in lung cancer risk in women, but this association was not seen in men. Very few of the individual fruits and vegetables examined had a significant effect on lung cancer risk in women, however apples were one of the individual fruits associated with a decreased risk in lung cancer. Women who consumed at least one serving per day of apples and pears had a reduced risk of lung cancer. Of the men involved, there was no association seen between any individual fruit or vegetable and lung cancer risk.⁴

2. CARDIOVASCULAR DISEASE

A reduced risk of cardiovascular disease has been associated with apple consumption. The Women's Health Study surveyed nearly 40,000 women with a 6.9-year follow-up, and examined the association between flavonoids and cardiovascular disease. Women ingesting the highest amounts of flavonoids had a 35% reduction in risk of cardiovascular events. Flavonoid intake was not associated with risk of stroke, myocardial infarction, or cardiovascular disease death. Quercetin did not have any association with cardiovascular disease, cardiovascular events, myocardial infarction or stroke. However, both apple intake and broccoli intake were associated with reductions in the risk of both cardiovascular disease and cardiovascular events. Women ingesting apples had a 13–22% decrease in cardiovascular disease risk.⁵

3. ASTHAMA AND PULMONARY FUNCTIONS

Apple consumption has been inversely linked with asthma and has also been positively associated with general pulmonary health. In a recent study involving 1600 adults in Australia, apple and pear intake was associated with a decreased risk of asthma and a decrease in bronchial hypersensitivity, but total fruit and vegetable intake was not associated with asthma risk or severity. Specific antioxidants, such as vitamin E, vitamin C, retinol, and β-carotene, were not associated with asthma or bronchial hypersensitivity. Previously it had been found that apple intake, as well as selenium intake, was associated with less asthma in adults in the United Kingdom. This study surveyed nearly 600 individuals with asthma and 900 individuals without asthma about their diet and lifestyle. Total fruit and vegetable intake was weakly associated with asthma, and apple intake showed a stronger inverse relationship with asthma.⁶

4. DIABETES

Apples help decrease the risk of diabetes. In the previously discussed Finnish study of 10,000 people, a reduced risk of Type II diabetes was associated with apple consumption. Higher quercetin intake, a major component of apple peels, was also associated with a decreased risk in type II diabetes. Myrectin and berry intake were also associated with a decreased risk in type II diabetes, but onion, orange, grapefruit and white cabbage intake were not associated with a lowered risk.⁷

5. CHOLESTROL-LOWERING EFFECT

Some of the apple's protective effect against cardiovascular disease may come from its potential cholesterol-lowering ability. Aprikian et al. (2001) found that when cholesterol fed rats were supplemented with lyophilized apples, there was a significant drop in plasma cholesterol and liver cholesterol and an increase in high-density lipoproteins (HDL). Furthermore, they found that cholesterol excretion increased in the feces of rats fed apples, suggesting reduced cholesterol absorption. In a second study, a similar cholesterol lowering effect was seen in cholesterol fed rats when rats were fed apples, pears, and peaches. Apples had a greater cholesterol lowering affect than the other two fruits. The three fruits also increased the plasma antioxidant potential, with apple having the greatest effect. Apples, pears, and peaches all had similar fiber content, but apples contained more phenolic compounds

suggesting that perhaps the phenolics in apples contribute to this effect.⁸

6. ANT-IOXIDANT ACTIVITY

Apple and especially its peels have been found to have a potent antioxidant activity and can greatly inhibit the growth liver cancer and colon cancer cells. The total antioxidant activity of apples with the peel was approximately 83µmol vitamin-C equivalents, which means that the antioxidant activity of 100 g apples is equivalent to about 1500 mg of vitamin-C. However, the amount of vitamin-C in 100 g of apples is only about 5.7 mg. Vitamin-C is a powerful antioxidant, but this research shows that nearly all of the antioxidant activity from apples comes from a variety of other compounds. Vitamin-C in apples contributed less than 4% of total antioxidant activity.⁹

OTHER HEALTH EFFECTS

Aside from chronic disease, apples may be used to help combat other prevalent disease in the world. Recently it has been found that crude extracts from immature apples actually inhibited enzymatic activities of cholera toxin in a dose dependent manner. Additionally, apple extracts reduced cholera toxin induced fluid accumulation in a dose dependent manner. The apple extracts were fractionated and each fraction was tested for inhibitory action on enzymatic activities of cholera toxin. The two apple extract fractions that contained highly polymerized catechins inhibited cholera toxin catalyzed ADP-ribosylation by 95% and 98%. The fraction containing non-catechin polyphenols caused only 3.5% inhibition and the fraction containing monomeric, dimeric, and trimeric catechins caused 39% inhibition.¹⁰

CONCLUSION

The present review reveals the description, active constituents, therapeutic uses and pharmacological activities. Apples contain different vitamins reportedly vitamin A, B and C. Apples have high content of organic acids like malic, citric, tartaric acid, etc. which give the fruit its acid flavour and improve its keeping qualities.

The fruit has been studied for its various pharmacological activities like cancer, cardiovascular disease, anti-oxidant, diabetes and Cholesterol-lowering effect. Green apple has a great perspective for the treatment of diseases like antacid, anti-diarrheal, soft laxative, diuretic and depurative, hearing loss etc. Further studies and investigations can be

performed on the fruit for its various pharmacological activities.

REFERENCES

1. Block G, Patterson B, Subar A. Fruit, vegetables, and cancer prevention: a review of the epidemiological evidence. *Nutr Cancer*. 1992;18:1–29.
2. Sun J, Chu Y, Wu X, Liu RH. Antioxidant and antiproliferative activities of common fruits. *J Agric Food Chem*. 2002;50:7449–7454.
3. Shaista, Top 26 Amazing Benefits Of Green Apples For Skin, Hair, And Health.updated on sep18,2017
4. Feskanich D, Ziegler R, Michaud D, Giovannucci E, Speizer F, Willett W, Colditz G. Prospective study of fruit and vegetable consumption and risk of lung cancer among men and women. *J Natl Cancer Inst*. 2000;92:1812–1823.
5. Sesso H, Gaziano JM, Liu S, Buring J. Flavonoid intake and risk of cardiovascular disease in women. *Am J Clin Nutr*. 2003;77:1400–1408.
6. Arts I, D. J, Harnack L, Gross M, Folsom A. Dietary catechins in relation to coronary heart disease among postmenopausal women. *Epidemiology*. 2001;12:668–675.
7. Knekt P, Kumpulainen J, Jarvinen R, Rissanen H, Heliovaara M, Reunanan A, Hakulinen T, Aromaa A. Flavonoid intake and risk of chronic diseases. *Am J Clin Nutr*. 2002;76:560–568.
8. Woods R, Walters H, Raven J, Wolfe R, Ireland P, Thien F, Abramson M. Food and nutrient intakes and asthma risk in young adults. *Am J Clin Nutr*. 2003;78:414–421.
9. Song Y, Manson J, Buring J, Sesso H, Lin S. Associations of dietary flavonoids with risk of type 2 diabetes, and markers of insulin resistance and systemic inflammation in women: a prospective and cross-sectional analysis. *J Am Coll Nutr*. 2005;24:376–84.
10. Leontowicz H, Gorinstein S, Lojek A, Leontowicz M, Ciz M, Soliva-Fortuny R, Park Y, Jung S, Trakhtenberg S, Martin-Belloso O. Comparative content of some bioactive compounds in apples, peaches, and pears and their influence on lipids and antioxidant capacity in rats. *J Nutr Biochem*. 2002;13:603–610.