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Phytochemistry, traditional uses and cancer chemopreventive activity of Amla (*Phyllanthus emblica*): The Sustainer.

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ABSTRACT

Ayurveda, which is the oldest health system in the world, appreciates and uses amla to treat a host of diseases and promote positive health. Amla [*Emblica officinalis*, or emblic myrobalan], is called amalaki in Sanskrit. It is extensively used as a rejuvenator in ayurveda. It is also used widely in combination with other two [chebulic and belleric] myrobalans [fruit-bearing plant species] as triphala. Amla is indeed, the key ingredient in the popular ayurvedic recipe, Chyavanaprasha. More than anything, it may be called as "King of Rasayana" [rejuvenation], owing to its multiple health benefits. *Phyllanthus emblica* or Indian gooseberry (Amla) possesses a vast ethnomedical history and represents a phytochemical reservoir of heuristic medicinal value. It is one of the oldest oriental medicines mentioned in Ayurveda as potential remedy for various ailments. The fruit is rich in quercetin, phyllaemblic compounds, gallic acid, tannins, flavonoids, pectin and vitamin C and also contains various polyphenolic compounds. A wide range of phytochemical components including terpenoids, alkaloids, flavonoids, and tannins have been shown to possess useful biological activities. Many pharmacological studies have demonstrated the ability of the fruit shows antioxidant, anticarcinogenic, antitumor, antigenotoxic, antiinflammatory activities, supporting its traditional uses. In this review, we have focused our interest on phytochemistry, traditional uses, cancer chemopreventive activity of *Phyllanthus emblica* both in vivo and in vitro. In view of its reported pharmacological properties and relative safety, *P. emblica* could be a source of therapeutically useful products.

Keywords: *Phyllanthus emblica*, Medicinal herb, anticarcinogenic, antitumor activity.

INTRODUCTION

Amla is a gift of nature to mankind. It is an indispensable part of the ayurvedic and unani system with amazing remedial qualities. In Sanskrit, it is called Amalaki or Dhartiphala. Amla is perhaps the single most often mentioned herb in "Charak Samhita", the Ayurvedic medicine literature (500 BC). Amla is a wonder herb and one of the precious gifts of nature to humans. Amla is known as "Divya" and "Amrut" or Amrit Phala in Sanskrit, which literally means fruit of heaven or nectar fruit. The Sanskrit name, Amalaki, translates as the Sustainer or The Fruit where the Goddess of Prosperity Resides. In Hindu religious mythology the tree is worshipped as the Earth Mother as its fruit is considered to be so nourishing as to be the nurse of mankind (Onions, 1994).

Plant anatomy and harvesting

- Kingdom : Plantae
- Division: Flowering plant

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- Class: Magnoliopsida
- Order: Malpighiales
- Family: Phyllanthaceae
- Tribe: Phyllanthae
- Subtribe: Fluegginae

In India, it is common to eat gooseberries steeped in salt water and turmeric to make the sour fruits palatable. There are two varieties of Amla - cultivated (gramya) and wild (vanya). The wild amla is small, while cultivated amla is big, smooth and juicy. Chemical composition of the amla fruit contains more than 80% of water. It also has protein, carbohydrate, fiber and mineral and also contains gallic acid which is a potent polyphenol. Vitamin C is important for human beings. It is necessary for the synthesis of the inter-cellular cementing substance which is responsible for keeping the cells of the body together. The amla fruit is reported to contain nearly 20 times as much vitamin C as orange juice. The edible amla fruit tissue has 3 times the protein concentration and 160 times the ascorbic acid concentration of an apple. The fruit also contains higher concentration of most minerals and amino acids than apples. Amla fruit ash contains chromium, Zinc and copper. It is considered as adaptogenic that improves immunity. The tree is small to medium sized, reaching 8 to 18 m in height, with a crooked trunk and spreading branches. The branch lets are glabrous or finely pubescent, 10-20 cm long, usually deciduous. The leaves simple, sub sessile and closely set along branch lets, light green, resembling pinnate leaves. The flowers are greenish-yellow. The fruit is nearly spherical, light greenish yellow, quite smooth and hard on appearance, with 6 vertical stripes or furrows. Ripening in autumn, the berries are harvested by hand after climbing to upper branches bearing the fruits. The taste of Indian gooseberry is sour, bitter and astringent, and is quite fibrous. (Brun, 1987)

Phytochemicals constituents & active ingredients

The active ingredient that has significant pharmacological action in amla is designated by Indian scientist as "Phyllemblin". The fruit is rich in quercetin, phyllaemblic compounds, gallic acid, tannins, flavonoids, pectin, and vitamin C and also contains various polyphenolic compounds. A wide range of phytochemical components including terpenoids, alkaloids, flavonoids, and tannins have been shown to possess useful biological (Kim et al., 2005; Arora et al., 2003). The fruits, leaves and bark are rich in tannins. The root contains ellagic acid and lupeol and bark contains leucodelphinidin. The seeds yield a fixed oil (16%) which is brownish-yellow in colour. It has the following fatty acids: linolenic (8.8%), linoleic (44.0%), oleic (28.4%), stearic (2.15%), palmitic (3.0%) and myristic (1.0%) (Thakur et al., 1989). The phytochemicals of this plant include hydrolysable tannins (Emblicanin A, Emblicanin B, punigluconin, pedunculagin) (Ghosal et al., 1996), flavonoids (Kaempferol 3 O alpha L (6'' methyl) rhamnopyranoside, Kaempferol 3 O alpha L (6'' ethyl) amnopyranoside) (Rahman, 2007), alkaloids (Phyllantidine and phyllantine) (Khanna et al., 1975). Gallic acid, ellagic acid, 1-Ogalloyl-beta-D-glucose, 3,6-di-O-galloyl-D-glucose, chebulinic acid, quercetin, chebulagic acid, corilagin together with

isostrictinnin, were isolated from the fruit of *Phyllanthus emblica* (Zany, 2003). A new acylated glucoside was isolated from the methanolic extract of the leaves of *P.emblica*. Their structures were named as apigenin7-O-(6''-butyryl-beta)-glucopyranoside, along with four known compounds gallic acid, methyl gallate, 1,2,3,4,6-penta-Ogalloylglucose and luteolin-4-Ooneohesperidoside (Desouky, 2008). The seeds of *P. emblica* contain fixed oil, phosphatides and small quantity of essential oil. In addition, the leaves contain gallic acid, ellagic acid, chebulagic acid and chebulinic acid. Phyllaemblic acid, a novel highly oxygenated norbisabolane were isolated from the roots of *P.emblica* and its structure was fully characterized by spectroscopic and chemical means (Zany et al., 2003). Ellagic acid and lupeol are present in roots of *P.emblica* (Kapoor 1990; Rastogi et al., 1993).

Nutritive value

Amla is well known for its nutritional qualities. It is rich in polyphenols, minerals and is regarded as one of the richest source of vitamin C (200-900 mg per 100 g of edible portion) (Jain et al., 2000; Bharthakur et al., 1993). Major components of nutritional importance are reported in table 1.

Table 1: Nutritional Value of fruit of *Phyllanthus emblica* (% or per 100g).

Chemical components	Percentage
Fruits: Moisture	81.2%
Protein	0.5%
Fat	0.1%
Mineral matter	0.7%
Fibre	3.4%
Carbohydrate	14.1%
Bulk elements Mg/100g.	Net weight
Calcium	0.05%
Phosphorous	0.02%
Iron	1.2 mg/100g
Vitamin C	600mg/100g
Nicotinic acid	0.2mg/100g (Gopalan et al., 1991)

The Ayurvedic description of amla

The fruit has these properties using the Ayurvedic classifications:

- Rasa (taste): sour and astringent are the most dominant, but the fruit has five tastes, including sweet, bitter, and pungent
- Veerya (nature): cooling
- Vipaka (taste developed through digestion): sweet
- Guna (qualities): light, dry
- Doshas (effect on humors): quietens all three doshas: vata, kapha, pitta, and is especially effective for pitta

Because of its cooling nature, amla is a common ingredient in treatments for a burning sensation anywhere in the body and for many types of inflammation and fever; these are manifestations of pitta (fire) agitation (Williamson, 2000). Amla has been considered the best of the Ayurvedic rejuvenative herbs, because it is tridosaghna. Uniquely, it has a natural balance of tastes (sweet, sour, pungent, bitter and astringent) all in one fruit, it stimulates the brain to rebalance the three main components of all physiological functions, the water, fire, and air elements within the body (Bajracharya, 1979).

Amla in Ayurveda

There are many benefits that amla imparts that are mentioned in Ayurvedic texts. These are:

Excellent source of Vitamin C

Amla is the most concentrated form of Vitamin C found in the plant kingdom, and when the whole fruit is used rather than an active ingredient, the Vitamin C is easily assimilated by the human body (Nisha et al., 2004, Gopalan et al., 1991). The Vitamin C in the amla fruit is bonded with tannins that protect it from being destroyed by heat or light.

Enhances food absorption

The regular use of Amla-Berry can strengthen digestion, absorption and assimilation of food. People taking it notice that they enjoy the taste of food better. It enhances all thirteen digestive fires (Agni). But it works more slowly and gently than ginger or other digestion-enhancing herbs, so it can be taken by people with a lot of Pitta without fear of creating excess stomach acid. In addition, it improves assimilation of iron for healthy blood.

Balances stomach acids

It improves digestion but does not heat the body, Amla-Berry is ideal for calming mild to moderate hyperacidity and other Pitta-related digestive problems.

Fortifies the liver

Amla-Berry helps purify the Rasa Dhatu (nutrient fluid) and Rakta Dhatu (blood), thus supporting the functions of the liver. It also strengthens the liver, helping it in eliminating toxins from the body (Pramyothin et al., 2006; Tasduq et al., 2005, Sultana et al 2004; Haque et al., 2000; Jayaweera, 1982).

Nourishes the brain and mental functioning

Amla-Berry is good for the brain. It is medhya nurturing for the mind and enhancing coordination among dhi (acquisition), dhriti (retention), and smriti (recall). It helps sharpen the intellect and mental functioning. It supports the nervous system and strengthens the senses (Reddy et al, 2011; Vasudevan et al., 2007; Perry, 1980).

Supports the heart

It is hridya, which means it nurtures the heart, blood and circulation. It supports the cardiovascular system. On the other hand, it sometimes acts as a cardiac stimulant (Williamson, 2002). Research shows that Amla helps lower cholesterol (Kim et al; 11, 2005) and protect from heart diseases (Yokozawa et al., 2007, Mathur et al 1996; Jacob et al., 1988; Shanmuga sundram et al., 1983).

Strengthens the lungs

The Amla-Berry helps pacify Kapha dosha as well. Therefore, Amla-Berry is a wonderful tonic for strengthening and nourishing the lungs (which are a major seat of Kapha dosha in the body), and the entire respiratory tract. It also pacifies Shleshaka

Kapha, which among other things governs moisture balance in the lungs. A fruit with seeds used for asthma, bronchitis and biliousness (Singh et al., 1979; His, 1982)

Regulates elimination

Amla-Berry pacifies Apana Vata, thus helping with the downward flow of energy in the body. They keep the function of elimination regular and ease constipation. The fruit is occasionally pickled or preserved in sugar. When dry it is said to be gently laxative (Drury, 1970), according to some sources the fresh fruit is also laxative (Nadkarni, 1999).

The fresh ripe fruits are used extensively in India as a laxative, one or two fruits being sufficient for a dose. They have been exported to Europe, preserved in sugar, and are valued as a pleasant laxative for children and made into a confection consisting of the pulp of the de-seeded fruit.

Enhances fertility

By balancing Apana Vata and by nurturing all the dhatus (body tissues), Amla-Berry also keeps menstruation regular and healthy. Amla-Berry supports the reproductive systems of both men and women and can help overcome difficulty in conceiving. It is a vrishya herb, which means that it enhances all the seven tissues (dhatus), including the reproductive tissue. This herb nurtures the ovaries and sperm, and it has a property called garbhasthapana, which means it enhances fertility and the possibility of conception. It is especially nurturing for women, strengthening the uterus and supporting reproductive health.

Helps the urinary system

Because it enhances all the thirteen agnis (digestive fires) and supports Apana Vata, Amla-Berry is especially supportive to the urinary system and can be helpful if you experience a mild burning sensation while urinating. It supports natural diuretic action, but does not force water from the body like diuretic pills. In other words, it helps eliminate waste from the body but does not over-stimulate the urinary system (Tsarong, 1994).

Good for the skin

Because Amla-Berry strengthens digestion, helps the liver detoxify and is rich in Vitamin C and other minerals, it is very good for the complexion. Amla-Berry moisturizes the skin, cleanses the tissues of toxins, and supports immunity of the skin against bacterial infection. It helps enhance glow and luster.

Promotes healthier hair

Amla-Berry boosts absorption of calcium, thus creating healthier bones, teeth, nails and hair. It also helps maintain youthful hair color and retards premature graying, and supports the strength of the hair follicles, so there is less thinning with age (Stuart, 1911). The crushed fruits have a good effect on hair growth and prevent hair graying (Stuart, 1911).

Acts as a body coolant

Although Amla-Berry is good for all doshas and seasons, it is especially effective in the hot season to cool Pitta dosha. It is

an especially good rasayana for people with Pitta and Vata body types (Dragendorff et al., 1989). In Tibetan medicine, the fruit has been described as having a sour taste with cooling potency (Tsarong and Tsewang, 1994).

Flushes out toxins

Individuals who have been eating "junk" food for a while tend to have accumulated deposits of preservatives and additives in the liver. Amla-Berry helps support the liver in flushing out chemicals and additives from the physiology (Zany et al., 2000).

Increases vitality

Because it has five tastes and supports all the doshas and many bodies' functions and cleanses the blood and the micro-channels of the body, Amla-Berry increases energy and removes fatigue (Brun et al., 1987). It supports regeneration of cells-the process by which tired old cells are replaced by vital, new ones.

Strengthens the eyes

Amla-Berry is called chakshushya, which means "strengthening the eyes" – (Chakshu means "eye" and ayushya means "rasayana" so it is literally a "rasayana for the eyes"). It supports the health of the eye by enhancing both Ranjaka Pitta (the sub-dosha of Pitta that governs liver function and the blood plasma) and Alochaka Pitta (the sub-dosha of Pitta that governs the eyes and vision). The tridoshic nature of Amalaki also makes it a good tonic for the eyes (Biswas et al., 2001). Infusion of the leaves is applied to sore eyes (Drury, 1970). The dried fruit immersed in water in a new earthen vessel a whole night yields a decoction which is used as a collyrium (a medical lotion applied to the eye as eyewash) in ophthalmia. It may be applied cold or warm (Nadkarni, 1999). In another treatment an infusion of the seeds is also used as a collyrium and applied with benefit to recent inflammations of the conjunctive and other eye complaints. The exudate collected from incisions made on the fruit is applied externally on inflammation of the eye (Jayaweera, 1980). In Ayurvedic terms it lowers pitta without disrupting the other two doshas and so amla is frequently used in cataract medicine (Suryanarayana et al., 2007).

Improves muscle tone

Amla-Berry enhances protein synthesis, which is why it is good for strengthening muscles and building lean muscle mass. Its unique Ayurvedic action offers athletes and body-builders a natural way to tone muscles and build lean mass.

Acts as an antioxidant

Amla-Berry and other rasayanas are effective broad-spectrum antioxidants and free radical scavengers, helping to reduce disease and slow the aging process. The use of amla as an antioxidant has been examined by a number of authors (Kumaran et al., 2006; Rao et al., 2005; Naik et al., 2005; Bajpai et al., 2005; Bhattacharya et al, 2002, Anita et al, 2002, Scartezini, 2000; Bandyopathay et al., 2000, Chaudhuri, 2003).

Experiments conducted at the Niwa Institute of Immunology in Japan have shown amla to be a potent scavenger of free radicals. The studies showed that amla preparations contained high levels of the free-radical scavenger, superoxide dismutase (SOD), in the experimental subjects (Goshal, 1996).

Enhances immunity

All of the benefits already mentioned make Amla- a strong immunity booster. Antibacterial, antifungal (Dutta, 1998), antiviral medical studies conducted on amla fruit suggest that it has antiviral properties (Udupa, 1993) and also functions as an antibacterial and anti-fungal agent (Treadway, 1994).

Boils and spots

The pericarp of the fruit is often used in decoctions along with other ingredients and also applied externally on boils with cow ghee to promote suppuration (Jayaweera, 1980).

Chelating agent

Photo aging of the skin is a complex biologic process affecting various layers of the skin with major changes seen in the connective tissue within the dermis. Emblica was shown to reduce UV-induced erythema and had excellent free-radical quenching ability, chelating ability to iron and copper as well as MMP-1 and MMP-3 inhibitory activity (Chaudhuri et al., 2003).

Diabetes

The fruits are used in the treatment of diabetes (Akhtar et al., 2011, Nampoothiri et al., 2011, Babu et al., 2004, Sabu et al., 2002, Drury, 1973) and in other references an infusion of the seeds are also used (Nadkarni, 1999). Decoctions of the leaves and seeds are used in the treatment of diabetes mellitus (Treadway, 1994).

Diarrhoea

It is used medicinally for the treatment of diarrhoea (Mahmood et al., 2009). As a fruit decoction it is mixed with sour milk and given by the natives in cases of dysentery. The bark partakes of the astringency of the fruit. A decoction and evaporation of the root solution produces an astringent extract equal to catechu. An infusion of the leaves with fenugreek seed is given for chronic diarrhoea (Jayaweera, 1980).

Diuretic

The fresh fruit is diuretic. A paste of the fruit alone or in combination with *Nelumbium speciosum* (the Egyptian Lotus), Saffron [author's note: more likely to be *Curcuma longa* (Indian saffron) than *Crocus sativus* (saffron)] and rose water is a useful application over the pubic region in irritability of the bladder, in retention of urine. It is used as a febrifuge, as an anti-inflammatory and unusually as an anti-diuretic.

Gonorrhoea

The juice of the bark combined with honey and turmeric is a remedy for gonorrhoea (Jayaweera, 1980; Nadkarni, 1999).

The Barks have been reputed to exert antidiarrheic effects and for treatment of leucorrhoea (vaginal infection) (Bunyapraphatsara, 1987).

Inflammation

P. emblica has been used for anti-inflammatory (Dang et al, 2011, Muthuraman et al 2010; Nicolis et al 2008) and antipyretic treatments by rural populations in its growing areas (Burkill, 1966).

Anticancer and antiulcer effects

The potential anticancer effects of aqueous fruit extract of *P. emblica* was tested in several different human cancer cell lines such as A549 (lung), HepG2 (liver), HeLa (cervical), MDA-MB-231 (breast), SKOV3 (ovarian) and SW620 (Colorectal). *P. emblica* extract significantly inhibited the growth of several human cancer cell lines at doses of 50-100 µg/ml (Ngamkitidechakul et al, 2010). Research found that amla is beneficial to treat different types of cancers.

Apoptosis

(programmed cell death), is a useful marker for predicting tumour response after anticancer treatment. The efficacy of *Emblica officinalis* Polyphenols (EOP) on the induction of apoptosis in mouse and human carcinoma cell lines. (Rajeshkumar et al., 2003). *P. emblica* extract was found to inhibit cell cycle regulating enzymes cdc 25 phosphatase in a dose dependent manner. The IC50 dose of extract was found to be 5 µg/ml (Jose et al., 2001). The modulatory effect of EOP fractions was evaluated on liver tumours induced by Nitrosodiethylamine (NDEA) in rats 5 days a week for 20 weeks followed by NDEA administration. Alkaline phosphatase (ALP), glutamate pyruvate transaminase (GPT), liver glutathione S-transferase (GST) was evaluated in the treated animals. The level of above mentioned enzymes was increased, whereas the treatment of EOP reduced the activities of all enzymes (Rajeshkumar et al., 2003).

Liver cancer

Only a few studies have speculated the chemopreventive effects of *P. emblica* against liver cancer. It was tested in vivo in wistar rats treated with carcinogen Diethylnitrosamine (DEN) (200mg/kg b.wt.i.p) to induce liver cancer. The results showed that pretreatment of methanolic fruit extract (100 and 200 mg/kg b.w) exhibited significant pathological manifestations at both the doses. *Emblica officinalis* has the potential to be useful in ameliorating the carcinogen-induced response in rat (Sarwat et al., 2008).

Skin Cancer

Research indicative of chemopreventive potential of *P. emblica* against skin carcinogenesis (Garima et al., 2005).

Antigenotoxicity & Antimutagenicity

The protective effect of *P. emblica* fruit extract against clastogenicity induced by lead nitrate on the incidence of sperm head abnormalities in the germ cells of mice. The results clearly

indicate that extract exhibited significant reduction in the frequency of sperm head abnormalities. The finding of the above study shows that *P. emblica* plays a key role in inhibition of heavy metal mutagenesis in mammals (Madhavi et al., 2007). The protection afforded by EO may be associated with its antioxidant capacity and through its modulator effect on hepatic activation and detoxifying enzymes (Banu et al., 2004). An aqueous extract of *Emblica officinalis* fruit protected mice against the chromosome damaging effects of the well known carcinogen 3, 4-benzopyrene (Nandi et al., 1997). The activation and mutagenicity of 2-Acetamidofluorene (2-AAF) was inhibited by *P. emblica*. It also inhibits the cytochrome P-450, aniline hydroxylase (Jeena et al., 1996).

Amla and Common Ailments

Constipation causes infrequent stool, anal and peripheral pain and abdominal discomfort. This persistent straining during the defecation leads to bleeding piles (hemorrhoids). Amla being rich in fibres regulates the bowel action and keeps constipation at bay. Juice of amla taken with 250 mg of giloy extract provides an effective remedy for hemorrhoids.

If your blood cholesterol troubles you then take amla. The vitamin C in amla helps in dilating the blood vessels and thereby lowering the blood pressure.

Grind dried amla into a fine powder and mix it with sugar candy (mishri). Store this mixture in a glass bottle and take one teaspoon of this mixture every day empty stomach. This will help maintain the cholesterol level.

Amla has anti diabetic quality. Make a mixture of equal quantity of amla, jamun and bitter gourd powder. Take one teaspoonful of this mixture once or twice a day. This mixture is also useful in treating conjunctivitis and glaucoma.

In case of acidity take 1 gram of dry amla powder with a little sugar in milk or water twice a day.

1 tablespoon of paste of amla leaves, mixed with honey is an effective treatment for diarrhoea.

For promoting hair growth and prevent premature greying of hair one can use amla rich oils and shampoos. For a quick home remedy soak amla powder in water for a week. Then use it wash hair. This preparation is a 3 in 1 shampoo, conditioner and hair dye. Learn more about how to get shiny hair.

Amla helps in restoring Vitamin C level in elderly, diabetic patients, hypertensive and women using oestrogen contraceptives.

Deficiency of Vitamin C makes a person lethargic, susceptible to infections, rheumatic pains and intestinal disorders. Consuming amla removes this lethargic feeling and makes one vibrant and upbeat.

According to a research, low vitamin C levels put a person at risk of developing gallbladder disorders. Taking amla saves one from gallbladder infections.

In children low vitamin C levels leads to disturbed growth and fragile disorders. For a person with low vitamin C level healing of wounds and fractures is a slow process. For quick healing, one must consume amla.

Amla is also a cure for scurvy. Dry amla powder mixed with an equal quantity of sugar taken in doses of one teaspoon thrice a day with milk provides enough vitamin C to beat scurvy.

Amla also works wonder with pregnant and lactating mothers. It also reduces the incidence of cancer of the gastrointestinal and respiratory tract. It provides protection against pollution. Amla is nature's best antioxidant. Food rich in antioxidants combat free radicals naturally and without any side effects. In indigestion the tender shoots of amla given in buttermilk cure indigestion and it is known that green fresh leaves combined with curds have similar effect.

Amla powder is mixed with red sandalwood (*Pterocarpus santalinum*) and prepared in honey to relieve nausea and vomiting.

A decoction of the leaves is used as a chemical-free bactericidal mouthwash. Bark of the. Another remedy suggests root bark rubbed with honey is used in aphthous stomatitis (an inflammation of the mouth).

When amla is in season it should be consumed in chutneys and pickles. And when not in season it can be taken in the form of murabba.

Cultural importance

Amla has been regarded as the sacred tree in India. The tree was worshipped as Mother earth and is believed to nurture humankind because the fruits are very nourishing. The leaves, fruits and Houses are used in worship in India. Kartik Mahatma and Vrat Kaumudi order the worship of this tree. The leaves are offered to the lord of shri Satyanarayana Vrata, Samba on Shri Shani Pradosha Vrata and Shiva and Gowri on Nitya Somvara Vrata. In Himachal Pradesh, this tree is worshipped in the month Kartik as propitious and chaste (Onion, 1994).

CONCLUSION

The healthy look is in and fitness has become a religion for the present generation. So is the mindless gulping of supplementary vitamin pills to sustain and boost their system. In fact, according to medical consultation they could even prove to be fatal for life. Instead if they choose the nature's products, they would not only benefit immensely but also can cut cost to buy those bitter pills to great extent. Such vitalizer is freely available in the vegetable market is the ubiquitous "Amla" or gooseberry. It is richest source of vitamin C. Vitamin C content of amla increases in the sun dried amla for example if 100 gms. of fresh amla gives out 600 mgs of Vitamin C, then when it is sundried, its content increases to 1500 to 1600 mg.

One fresh gooseberry is equal to consuming 16 bananas or 3 oranges. A variety of phytochemical such as tannins, flavonoids, terpenoids and alkaloids are reported to indicate several pharmacological properties such as antioxidant, anticancer, antitumor, antigenotoxic, and ant carcinogenic effects. It is considered to be a safe herbal medicine without any adverse effects. So it can be concluded that Indian gooseberry is a traditionally and clinically proven fruit for both its application and efficacy.

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