Amla (Phyllanthus emblica L.): A wonderful dryland fruit crop

Dinesh Chand, Nilamani Dikshit, Smita Shingane Sunil Gomashe and Jameel Akhtar

Amla (*Phyllanthus emblica* L.) belongs to family *Euphorbiaceae*. It is commonly known as *Emblica Myrobalm*, Indian Gooseberry, Aonla, Amla, Aola etc. It is indispensable part of the ayurvedic and unani system of medicines 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). With richness of Vitamin C Amla has great nourishing properties packed with minerals and desirable amino acids. Amla is known differently by vernacular names in various languages.

Table 1. Vernacular names of *Phyllanthus emblica*

Vernacular Name	**Languages**	**Vernacular Name**	**Languages**
Amalika	Sanskrit	Sunhlu	Mizo
Dhatric	Maithili	Amala	Nepali
Amla	Hindi	Amloki	Bengali
Amla	Gujarati	Amlakhi	Assamese
Aavnlaa (awla)	Urdu	Anlaa	Oriya
Avala	Marathi	Aula	Punjabi
Ambare	Garo	Nellikka	Malayalam
Avalo	Konkani	Heikru	Manipuri
Suaklu	Paite	Halilaj or ihlilaj	Arabic
Sohmylleng	Khasi	Rasi usiri or rasi usirikai	Telugu
Nellikkai, Nellikkaai	Tamil	Nellikkai, Nellikkaai	Kannada
Nelli	Sinhala	Mak kham bom	Lao
Mak kham pom	Thai	Anmole	Chinese
Kantout Prei	Khmer	Skyu ru ra	Tibetan
Melaka	Malay (A state in Malaysia	Zeephyu thee	Myanmar

Amla has great value as a religious fruit and it is considered sacred by Hindu community where they believe that Lord Vishnu dwells. It is regarded as “Amrit” and this religious belief signifies that it almost cures most of the diseases which considered important for extending overall longevity of mankind.

Description of the plant

Amla is a small to medium sized deciduous tree generally attains a height of 8-18m with crooked trunk and spreading branches. The bark is thin light whitish- grey, exfoliating in small thin irregular flakes. The leaves are simple, sub-sessile, closely set along the branchlets, small, light green, ovate or linear-oblong, entire. While flowers are greenish yellow, unisexual, male flower numerous on shortly stalked and are without a glandular disc, Stamens 3, filaments are united in to a short central column and female flowers few in number, sessile with 3 celled ovary and styles are connate at the base, each is irregularly twice bifid, the berries globose, yellowish- green, rather indistinctly 6-furrowed with 6 prominent lines, running vertically from the tip to the base are present on same twig or branchlet. The perianth segments are 6, oblong, obtuse, imbricate. Enclosed within the flesh is present 6 ribbed stone which finally splits in to 3 portions, each containing usually trigonous seed. Flowering occurs from March to May. Best harvesting time of Amla fruit is from November to February when the fruits have maximum ascorbic acid content.

Amla tree

Fresh green fruits

Leaves

Fruits after harvest

Table 2. General morophological characters of *Phyllanthus emblica*

Plant morophology	**Characters**
Habit	The tree is small to medium size, 8-20 m height, crooked trunk and spreading branches, branch lets glabrous or finally pubescent, 10-20 cm long, usually deciduous
Leaves	Simple, sub sessile and closely set along branch lets, light green, resembling pinnate leaves
Flowers	Flowers have six segments, but no real petals, male and female flowers are carried separately on the same branch. Greenish yellow
Fruit	Nearly spherical, light greenish yellow, quite smooth and hard On appearance, with six vertical strips or furrows with hardness
Fruit Taste	The taste of amla is sour, bitter and quite fibrous (Brun, 1987)

Table 3. Phytochemicals compositions of *Phyllanthus emblica* plant parts

Plants parts	Chemical components	References
Plants	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 *et al.,*2009
	Alkaloides (Phyllantidine and phyllantine)	Khanna and Bansal, 1975
Roots	A novel oxygenated, norbisabolane were isolated and its structure was fully characterized by spectroscopic and chemical means	Kapoor 1990; Rastogi *et. al.,* 1993
	Ellagic acid and lupeol	Kapoor 1990; Rastogi *et. al.,* 1993
Leaves	A new acylated glucoside was isolated from the methanolic extract of the leaves of *P. emblica.* Their structures were named as apigenin 7-O-(6''-butyryl-beta)- glucopyranoside, along with four known compounds gallic acid, methyl gallate, 1,2,3,4,6-penta-Ogalloylgucose and luteolin-4 Oneohesperiodoside	Desouky, 2008
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%), Phosphorus (0.02%), iron (1.2 mg/100g), vitamin C (600mg/100g), nicotinic acid (0.2mg/100g)	Gopalan *et al.*, 1991
	Rich in polyphenols, minerals and richest source of vitamin C (200-900 mg/100g) of edible portion	Jain *et al.*, 2000; Bharthakur *et al.,* 1991
	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	Zany, 2003

	the fruit of *P. emblica*	
Seed	Seed yield a fixed oil (16%), browinish-yellow in colour containing- 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

Table 4. Nutrional uses of *Phyllanthus emblica* in Ayurveda

Uses	**Description**	**References**
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, Goplan *et al.,* 1991
Fortifies the liver	Amla-Berry promotes purification of the Rasa Dhatu (nutrient fluid) and Rakta Dhatu (blood), helps in strengthening liver to expel toxins from body	Tasduq *et al.,* 2005, Jayaweera, 1982.
Nourishes the brain and mental functioning	Amla is best brain nourishing fruit which balances and increases nervous system coordination.	Reddy *et al.*, 2011; Vasudeven *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 cardiac stimulant	Williamson, 2002
	Amla helps lower cholesterol	Kim *et. al*., 2005
Protect to heart diseases	Amla helps to protect heart diseases	Yokozawa *et al.*, 2007, Mathur *et al*., 1996, Jacob *et al.*, 1988; Shanmugasundran *et al.*, 1983
Helps the urinary system	Amla has excellent diuretic properties which supports urinary system without creating extra pressure on the urinary system.	Tsarong, 1994

Promote healthier hair	Amla-Berry boots absorption of calcium. Helps in maintaining hairs by giving strength and retards early greying of the hairs.	Stuart, 1911
Acts as body coolant	It is especially effective in the hot season to cool pitta dosha. The barks have been reputed to exert antidiarrheic effects and for treatment of leucorrhoea (vaginal infection)	Bunyapraphatsara,1987
Use as a Inflammation	*P. emblica* has been used for anti-inflammatory medicine.	Dang *et al.,* 2011; Muthuraman *et al.*, 2010; Nicolis *et al.*, 2008
Antipyretic treatments	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), Hep G2 (liver), HeLa (cervical), MDA-MB-231 (breast), SKOV3 (ovarian) and SW620 (colorectal). Research found that amla is benecifal to treat different types of cancers.	Singh *et al.*, 2011, Rajeshkumar *et al.,* 2003 Zhao *et al.,* 2015
Skin cancer	Research indicative of chemo preventive potential of *P. emblica* against skin carcinogenesis	Garima *et al.*, 2005
Antigen toxicity & Anti mutagenicity	*P. emblica* plays a key role in inhibition of heavy metal mutagenesis in mammal's	Madhavi *et al*., 2007
Flushes out toxins	"Junk food" eaters for a while tend to have accumulated deposits of preservatives and additive in the liver. Amala-Berry helps support the liver in flushing out chemicals and additives from the physiology	Singh *et al.*, 2011 Tahir *et al.*, 2016
Increases vitality	Amla –berry increases energy and remedies fatigue. It supports regeneration of cells-the process by which tired old cells are replaced by vital, new ones	Brun *et al.*, 1987 Chaphalkar *et al.* 2017

Table 5. The Ayurvedic uses of *Phyllanthus emblica*

Diseases	Doses/ How to use	References
Liver disorder	Amala-Berry helps support the liver in flushing out chemicals and additives from the physiology	Singh *et al.*, 2011,
Eye disease (Opthalmia)	The dried fruit immersed in water in a new earthen vessel a whole night yields a decoction which is used as collyrium (a medicinal lotion applied to the eyes as eye wash) in Opthalmia. It may be applied cold or warm	Nadkami, 1999
Inflammations of the conjunctive and other eye complaints	An infusion of the seeds is also used as a collegium and applied with benefit to recent inflammations of the conjunctive and other eye complaints. The exudates collected from incisions made on the fruit is applied externally on inflammation of the eye	Jayaweera, 1980
For week eyes and Cataract	Frequent use of Amla	Biswas *et., al* 2001 and Suryanarayana *et al.,* 2007
Diabetes	The fruits are used in the treatment of diabetes	Akhtar *et al.*, 2011, Nampoothiri *et al.*, 2011, Banu *et al.*, 2004, Sabu *et al.*, 2002, Drury, 1973
Diabetes	Decoctions of the leaves and seeds are used in the treatment of diabetes mellitus	Treadway, 1994
Chronic diarrhoea	An infusion of the leaves with fenugreek seed is given for Chronic diarrhoea	Jayaweera, 1980
Gonorrhea	The juice of the bark combined with honey and turmeric is a remedy for gonorrhea	Jayaweera, 1980; Nadkarni, 1999
Hair graying	The paste of crushed fruits on hair	Stuart, 1911

Conclusions:

Amla is a religiously worshiped high medicinal value fruit for Ayurvedic and Unani systems of medicines. It is widely exploited in almost all Ayurvedic and Pharmaceutical products worldwide. Its each and every plant part has therapeutic value which is very effective for curing various diseases. Keeping this in mind Amla will continue to be a major preventive medicine in near future.

Modern research need to focus to determine the new findings as *Amla* is interesting plant because of its novel agents for the pharmaceutical, cosmetics, dietary supplements and many more. Studies on *Phyllanthus* collection, characterization, evaluation, classification and documentation can help to promote this wonderful tree.

Disclaimer: *The information given in the above article regarding various uses of Amla is merely a compilation of information from various research articles, web pages and books available online. Authors are not responsible for the medicinal or any other use reported here.*

References (if any)

1. Akhtar, M.S., Ramzan A, Ali A., Ahmad M. (2011) Effect of Amla fruit (*Emblica officinalis* Gaertn.) on blood glucose and lipid profile or normal subject and type 2 diabetic patients. *Int. J Food Sci Nutr.* Apr 18. [Epub ahead of print].
2. Banu, S.M., Selvendiran K, Singh, J.P., Sakthisekaran, D. (2004) Protective effect of *Emblica officinalis* ethanolic extract against 7, 12-dimethylbenz (a) anthracene (DMBA) inducedgenotoxicity in Swiss albino mice. *Hum Exp Toxicol*. 23: 527-31.
3. Bharthakur, N.N. Amold N.P. (1991). Chemical analysis of the emblic (*Phyllanthus emblica* L.) and its potential as a good sources. *Scientia Horticult.* 47: 99-105.
4. Biswas, N.R., Gupta S.K., Das G.K. *et al.* (2001) Evaluation of Ophthacare eye drops – a herbal formulation in the management of various ophthalmic disorders. *Phytother Res*. 15 (7): 618-620.
5. Brun V, Schumacher T. (1987) Traditional herbal Medicine in Northern Thailand. University of California Press, Berkeley, 349.
6. Bunyapraphatsara, N. (1987). Personal communication: uses of Phyllanthus species in traditional Thai medicine, translated from nine books in Thai. Medicinal Plant Information Center,. Mahidol University, Bangkok.
7. Burkill, I.H.A. (1966). Dictionary of the Economic Products of the Malay Peninsula, *Vol. 1*, Ministry of Agriculture and Co-operatives, Kuala Lump.
8. Chaphalkar R., Apte K. G., Talekar Y., Ojha S. K., and Nandave M. (2017) Antioxidants of *Phyllanthus emblica* L. Bark Extract Provide Hepato protection against Ethanol-Induced Hepatic Damage: A Comparison with Silymarin. Oxidative Medicine and Cellular Longevity, https://doi.org/10.1155/2017/3876040
9. Dang, G.K., Parekar R.R, Kamat S.K., Scindia, A.M., Rege, N.N. (2011). Antiinflammatory activity of *Phyllanthus emblica* , *Plumbago zeylanica* and *Cyperus rotundus* in acute models of inflammation. *Phytother Res.* 25 (6): 904-908.
10. Desouky- El, S.K., Ryu, S.Y., Kim, Y.K. (2008). A new cytotoxic acylated apigenin glucoside from *Phyllanthus emblica* L. *Nat Prod Res.* 22: 91-95.
11. Drury, Colonel Heber (1973). The useful plants of India; with notice of their chief medicinal value in commerce, medicine and the arts. Higginbotham and Co. Madras.
12. Garima Sancheti, Archana Jindal, Rimpu Kumari, Goyal. (2005). Chemopreventive Action of *Emblica officinalis* on Skin Carcinogenesis in mic. *Asian pacific J cancer Prev*. 6: 197-201.
13. Ghosal, S., trapathi, V.K. Chauhan, S. (1996). Active constituent of *Emblica officinalis*: part 1 st the chemistry and antioxidant effects of two new hydrolysable tannins, emblicanin A and B. *Indian J*

Chem. 35b: 941-948.
14. Goplan, C. Sastri, BVR, Balasubramaniam, S.C. (1991). Nutritive value of Indian foods. NIN, Hyderabad, India.
15. Jacob, A. Pandey, M., Kapoor, S. and Saroja , R. (1988). Effect of the Indian gooseberry (amla) on serum cholesterol levels in men aged 35-55 years. *Eur J Clin Nutr*. 42(11): 939-944.
16. Jain, S.K. and Akhurdiya, D.S. (2000). Anola: Potential fruit for processing. *Delhi Garden Mega* 38: 50-51.
17. Jayaweera D. M.A. (1982) Medicinal Plants Used in Ceylon: Part IV. National Science Council of SriLanka, Colombo.
18. Jayaweera, D.M.A. (1980). Medicinal Plants used in Ceylon. Part 2. *National Science Council of Sri lanka*. Colombo.
19. Kapoor, LD. (1990). Handbook of Ayurvedic Medicinal Plants. CRC Press. Boca taton .
20. Khanna P and Bansal R (1975) Phyllantidine and phyllantine from *Emblica officinallis* Gaertn. leaves, fruit and in vitro tissue cultures, Indian Journal of Experimental Biology, 13, 82-83.
21. Kim, H.J. Yokozawat, kimphy, Tohda C., rao T.P., Juneja, L.R. (2005). Influence of amla (*Emblica officinalis* Gaertn.) on hypercholesterolemia and lipid peroxidation in cholesterol-fed rats. *J. Nutr. Sci vitaminol.* 51: 413-418.
22. Madhavi, D. Rudrama Devi k., Kesava Rao K., Reddy, P.P., (2007). Modulating effect of Phyllanthus fruit extract against led genotoxicity in germ cells of mice. *J. Envi Biol*. 28: 115-117.
23. Mathur, R. Sharma, A., Dixit V.P., Varma, M. (1996). Hypolipidaemic effect of fruit juice of *Emblica officinalis* in cholesterol-fed rabbits. *J. Ethnopharmacol.* 50 (2): 61-68.
24. Muthuraman, A. Sood, S., singla, S.K. (2010) The anti-inflammatory potential of phenolic compounds from *Emblica officinalis* l. in rat. *Inflammopharmacology.* 2010, July 2. [Epub ahead of print].
25. Nadkarni, K.M., Nadkarni, A.K. (1999). Indian Materia Medica – with Ayurvedic, Unani- Tibbi, Siddha, Allopathic, Homeopathic, Naturopathic and home remedies. Popular Pakistan private Ltd, Bombay, India. 1(81): 7154-142-9.
26. Nampoothiri, S. V. prathapan, A. Cherian, O.L., Raghu, K.G., venugoplan, V.V., Sundaresan A. (2011) In vitro antioxidant and inhibitory potential of *Terminalia bellerica* and *Emblica officinalis* fruits against LDL oxidation and key enzymes linked to type 2 diabetes. *Food Chem Toxicol.* 49(1): 125-131.
27. Nicolis, E., Lampronti, I. Dechecchi, M.C. et.al. (2008) Pyrogallol, an active compound from the medicinal plant *Emblica officinalis*, regulates expression of pro-inflammatory genes in bronchial epithelial cells. *Int Immunopharmacol.* 8 (120): 1672-1680.
28. Nisha, P., Singhal, R.S., Pandit A.B. (2004) A study on degradation kinetics of ascorbic acid in amla (*Phyllanthus emblica* L.) during cooking. *Int J Food Sci Nutr.* 55 (5): 415-422.
29. Onions, Alan (1994) Siddha Medicinal Herbs as Cosmetics Ingredients. SPC, March1994.
30. Perry, L.M. (1980) Medicinal plants of East and Southest Asia: Atributed Properties and Uses. Pp. 149-150 MIT Press, Cambridge.
31. Rahman S, Akbor M M, Howlader A & Jabbar A (2009) Antimicrobial and cytotoxic activity of the alkaloids of Amlaki (*Emblica officinalis*), Pakistan Journal of Pharmaceutical Sciences, 12, 1152–1155.
32. Rajeshkumar NV, Radhakrishna Pillai M, Kuttan R (2003) Induction of Apoptosis in Mouse and Human Carcinoma Cell lines by *Emblica officinalis* polyphenols and its effect on chemical carcinogenesis. *J. Exp Clin Cancer Res*. 22: 201-212.
33. Rastogi RP and Mehrotra BN. (1993) Compendium of Indian Plants. CDRI, Lucknow and Publication and Information Directorate, New Delhi.
34. Reddy, V.D., Padmavathi, P., Kavitha, G., Gopi S., Varadacharyulu, N. (2011) *Emblica officinalis*

ameliorates alcohol-induced brain mitochondrial dysfunction in rats. *J Med Food.* 14 (1-2): 62-68.

35. Sabu M.C., Kuttan, R. (2002) Anti-diabetic activity of medicinal plants and its relationship with their antioxidant property. *J Ethanopharmacol.* 81 (2): 155-160.
36. Shanmugasundaram, K. R., Seethapathy, P.G., Shanmugasundaram, E.R. (1983) Anna pavala sindhooram-an antiatherosclerotic Indian drug. *J Ethanopharmacol.* 7(3): 247-265.
37. Singh E., Sharma S., Pareek A., Dwivedi J., Yadav S. and Sharma S. (2011) Phytochemistry, traditional uses and cancer chemopreventive activity of Amla (Phyllanthus emblica): The Sustainer. Journal of Applied Pharmaceutical Science 02 (01); 2011: 176-183.
38. Stuart, G.A. (1911) Chinese Materia Medica Vegetable kingdom. American Presbyterian Mission Press, Shanghai, 558.
39. Suryanarayana, P. saraswat, M., petrash, J.M., reddy G.B. (2007) *Emblica officinalis* and its enriched tannoids delay streptozotocin-induced diabetic cataract in rats. *Mol. Vis*. 13: 1291-1297.
40. Tahir I., Khan M. R., Shah N. A. and M. Aftab (2016) Evaluation of phytochemicals, antioxidant activity and amelioration of pulmonary fibrosis with *Phyllanthus emblica* leaves. *BMC Complementary and Alternative Medicine*, 16: 406
41. Tasduq, S.A., Kaisar, P., Gupta, D.K., et al. (2005). Protective effect of a 50% hydroalcoholic fruit extract of *Emblica officinalis* against anti-tuberculosis drugs induced liver toxicity. *Phytother Res.* 19(3): 193-197.
42. Thakur, R.S., Puri, H.S., Husain, Akhtar.(1989) Major Medicinal Plants Of India. Central Institute of Medicinal and Aromatic Plants, Lucknow, India.
43. Treadway, Linda (1994) Amla traditional food and msdicine. Herbal Gram; 31:26. Herbal Gram: *The Journal of the American Botanical Council.* 1994I; 31: 26.
44. Tsarong and Tsewang J. (1994) Tibetan Medicinal Plants. 1st ed. Tibetan Medicinal publications India, 1994.
45. Vasudevan, M., Parle M. (2007) Effect of Anwala churna (*Emblica officinalis* Gaertn): an ayurvedic preparation on memory deficit rats. *Yakugaku Zasshi*. 127 (10): 1701-1707.
46. Vasudevan, M., Parle M. (2007) Memory enhancing activity of Amwala churna (*Emblica officinalis* Gaertn): an Ayurvedic preparation. *Physiol Behav*. 91 (1): 46-54.
47. Williamson EM (editor) (2002) Major herbs of Ayurveda, 2002 Churchill- Livingstone, London.
48. Yokozawa, T., Kim, H.Y., Kim, H.J., Okubo, T., Chu, D.C., Juneja, L.R. (2007) (*Emblica officinalis* Gaertn) prevents dyslipidaemia and oxidative stress in the ageing process. *Br J Nutr.* 97(6): 1187-1195.
49. Zhao T., Qiang S., Maud M. and Witcher M. (2015) Anticancer Properties of *Phyllanthus emblica* (Indian Gooseberry). Oxidative Medicine and Cellular Longevity http://dx.doi.org/10.1155/2015/950890

Terms - Do not remove or change this section (It should be emailed back to us as is)