



## EVALUATION OF PHYSICOCHEMICAL AND PRELIMINARY PHYTOCHEMICAL STUDIES ON THE FRUIT OF EMBLICA OFFICINALIS GAERTN

AK MEENA\*, ARJUN SINGH, MM RAO

National Institute of Ayurvedic Pharmaceutical Research, Patiala – 147001, Punjab, India. E-mail: [ajaysheera@gmail.com](mailto:ajaysheera@gmail.com)

### ABSTRACT

The present communication attempts to evaluate the physicochemical and preliminary phytochemical studies on the fruit of *Emblca officinalis* Gaertn, Euphorbiaceae family. Amla is one of the most celebrated herbs in the Indian traditional medicine system, Ayurveda. Amla traditional uses include as a laxative, eye wash, appetite stimulant, restorative tonic, and to treat anorexia, indigestion, diarrhea, anemia, and jaundice. Amla is becoming increasingly well known for its unusually high levels of Vitamin C, which is resistant to storage and heat damage due to cooking. It is found natively in India. Indian gooseberry has been used as valuable ingredient of various medicines in India and abroad. As there is no detailed standardisation work reported on fruit, the physicochemical parameters, preliminary phytochemical constants, toxic heavy metals, pesticide residue, and aflatoxin analysis are carried out. The study revealed specific identities for the particular crude drug which will be useful in identification and control to adulterations of the raw drug.

**Key words:** *Emblca officinalis* Gaertn, Physicochemical, Vitamin C, Heavy metals, TLC.

### INTRODUCTION

Amla (*Emblca officinalis* Gaertn, family Euphorbiaceae) is a native of India, Ceylon, Malaya and China. The fruit is used as a major constituent in several Ayurvedic preparations such as *Chyavanprash* and *Rasayana* which promotes health and longevity<sup>1</sup>. Amla is one of the richest sources of Vitamin C known. In addition to this, potent antioxidant, several active tannoid principles (Emblcannin A, Emblcannin B, Punigluconin and Pedunculagin) have been identified which appear to account for its health benefits<sup>2-3</sup>. Amla has been reported to possess expectorant, purgative, spasmolytic, antibacterial, hypoglycemic<sup>4-5</sup>, hepatoprotective and hypolipidemic activity<sup>6</sup>. The aqueous extract has been reported to have anti-pyretic laxative and tonic properties and also showed antibacterial activity<sup>7</sup>. The ascorbic acid content of fresh Amla fruit can range up to 950/100 gm which is said to highest among all fruits next only to Barbados cherry<sup>8</sup>.

### 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<sup>9</sup>.

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<sup>10</sup>.

### BOTANICAL DESCRIPTION

A small to medium sized deciduous tree, 8-18 meters height with thin light grey bark exfoliating in small thin irregular flakes, leaves are simple, sub sessile, closely set along the branchlets, light green having the appearance of pinnate leaves; flowers are greenish yellow, in axillary fascicles, unisexual, males numerous on short slender pedicels, females few, sub sessile, ovary 3-celled; fruits globose, fleshy, pale yellow with six obscure vertical furrows enclosing six trigonous seeds in 2-seeded 3 crustaceous cocci<sup>11</sup>.

### CHEMICAL COMPOSITION

The fruits of *Emblca officinalis* are rich in tannins. The fruits have 28% of the total tannins distributed in the whole plant. The fruit contains two hydrolysable tannins Emblcannin A and B, which have antioxidant properties, one on hydrolysis gives gallic acid, ellagic acid and glucose wherein the other gives ellagic acid and glucose. The fruit also contains Phyllembin<sup>12-14</sup>.

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%)<sup>15</sup>.

### ACTIVE CONSTITUENTS

Tannins and Gallic acid (Figure 1).

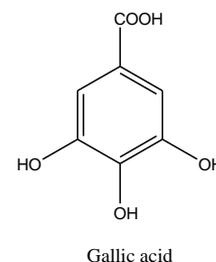
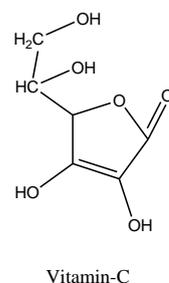


Figure 1: Tannins and Gallic acid

### RESULTS AND DISCUSSION

The fruits of *Emblca officinalis* Gaertn were collected and analysed the various standardisation parameters. Preliminary phytochemical results showed the presence or absence of certain phytochemicals in the drug. The tests performed using n-Hexane, Chloroform, Ethyl acetate, alcoholic and water extracts. Phytochemical test revealed the presence, Alkaloid, glycoside, saponins, flavonoids, polysaccharides, Steroid, Tannin and results are given in Table 1.

The presence of heavy metals namely Arsenic, Mercury, Cadmium and Lead were analysed in the sample, the concentration of all the heavy metals were below the WHO/FDA permissible limits<sup>16-17</sup>. The presence of pesticide residue organochlorine pesticide, organophosphorous pesticides and Pyrethroids were not detected in the sample.

Physio-chemical parameters of the fruits of *Emblca officinalis* Gaertn are tabulated in Table 2. The pH value of 10% w/v aqueous solution is acidic (2.81). Deterioration time of the plant material

depends upon the amount of water present in plant material. If the water content is high, the plant can be easily deteriorated due to fungus. The loss on drying at 105°C in fruits was found to be 3.05 %. Total ash value of plant material indicated the amount of minerals and earthy materials attached to the plant material. Analytical results showed total ash value content was 3.88 %. The negligible amount of acid-insoluble siliceous matter present in the plant was 0.53%. The water-soluble extractive value was indicating the presence of sugar, acids and inorganic compounds, Total tannins 13% in the sample. The alcohol soluble extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids the results given in Table 2.

Thin layer chromatographic technique was used to separate the chemical compounds present in the drug. Various solvent systems were checked to separate the maximum number of chemical compounds in the drug. Take 4g of the sample was soaked in 40 ml of rectified spirit (90%) with occasional shaking for 18 hrs, boiled for 10 minutes and filtered. The filtrate was evaporated and extracted with Chloroform. The soluble portion was filtered, concentrated and made upto 10 ml in standard flask. 20 µl, 25 µl and 30 µl of the solution was applied on (E. Merck) Aluminium plate pre-coated with Silica gel 60 F<sub>254</sub> of 0.2 mm thickness using Linomat IV applicator. The plate was developed in Toluene: Ethyl acetate (9: 2 v/v). After air drying the plate was not visualized in UV 254 and 366 nm. The plate was then dipped in Vanillin -Sulphuric acid and heated in air oven at 105°C till the spots appeared (Figure 2) and the results of R<sub>f</sub> values given in Table. 3.



20 µl      25 µl      30 µl

**Figure 2:** TLC of *Emblica officinalis* Gaertn (Toluene: Ethyl acetate: 9:2 v/v)

**Table 1: Preliminary phytochemical tests for different solvent extract of fruit of *Emblica officinalis* Gaertn**

Natural product	Test performed	Results
Alkaloid	Dragendorff's test	+ ve
Coumarin	Alkaline test	-ve
Flavone	Shinoda test	+ve
Steroid	Liebermann-Burchard reagent	-ve
Tannin	Neutral FeCl <sub>3</sub>	+ve
Sugar	Molisch's test	+ve
Terpenoid	Noller's test	-ve
Saponin	NaOH solution	-ve

**Table 2: Physicochemical parameters of fruit of *Emblica officinalis* Gaertn**

Parameters	Results
Description	Brownish
Foreign matter	< 1.0 %
pH (10 % w/v aqueous solution)	2.81
Loss on drying at 105 °C	3.05 % w/w
Total ash	3.88 % w/w
Acid-insoluble ash	0.53 % w/w
Water-soluble extractive	59.15 % w/w
Alcohol-soluble extractive	24.38 % w/w
Total tannins	13 % w/w

**Table 3: TLC of *Emblica officinalis* Gaertn**

S. No.	After derivatization in visible light	
	Colour	R <sub>f</sub>
1	Grey	0.39
2	Grey	0.45
3	Grey	0.89

### CONCLUSION

Preliminary phytochemical as well as various aspects of the fruits sample were studied and described along with physico-chemical, toxic heavy metal, aflatoxin and TLC studies in authentication, adulteration for quality control of raw drugs. The fruits of *Emblica officinalis* exhibit a set of diagnostic characters, which will help to identify the drug in dried condition.

It has been concluded from this study that estimation of heavy metals and pesticides residue is highly essential for raw drugs or plant parts used for the preparation of single and compound formulation drugs. The periodic assessment is essential for quality assurance and safer use of herbal drugs.

### ACKNOWLEDGEMENT

The authors are very grateful to Director General, CCRAS, New Delhi for providing encouragement and facilities for carrying out this work. Authors are thankful to Ms. Rekha for her assistance during writing of the paper.

### REFERENCES

- Rajkumar NV, Theres M, Kuttan, *Emblica officinalis* fruits afford protection against experimental gastric ulcers in rats, *Pharmaceut. R. Biol.*, 2001, 39 (5); 375-380.
- Rao TS, Kumari KK, Netaji B, Subhokta PK, *Ayurveda Siddha J. Res.*, 1985,6;213-224.
- Rastogi RP, *Compendium of Indian Medicinal plants*, CDRI, Lucknow and ID, New Delhi, 1993,1; 530.
- Jayshri S, Jolly CI, *Phytochemical antibacterial and pharmacological investigations on *Monordia chiranlia* and *Emblica officinalis**, *Ind. J. Pharm. Sci.*, 1993,1; 6-13.
- Jamwal KS, Sharma IP, Chopra L, *Pharmacological investigations on the fruits of *Emblica Officinalis**, *J. Sci. Ind. Res.*, 1959,18 c; 180-181.
- Thakur CP, Mandal K, *Effect of *Emblica Officinalis* on Cholesterol Induced atherosclerosis in rabbits*, *Ind. J. Med. Res.*, 1984,79; 142-146.
- Vinayagamoorthy T, *Antibacterial activity of some medicinal plants of Srilanka Ceylon*, *J. Sci. Biol.*, 1982, 11; 50-55.
- Shankar G, Aonla for your daily requirement of Vitamin C, *Indian Hort.*, 1969, 13; 9-15.
- Williamson EM (editor), *Major Herbs of Ayurveda*, Churchill-Livingstone, London, 2002, 1; 367.
- Bajracharya M B, *Ayurvedic Medicinal Plants*, Kathmandu, Piyusavarsi Ausadhalaya, 1979.
- Indian Medicinal Plants -A compendium of 500 species*, Orient Longman Publications, 1997, Vol-3; 256-263.
- Wealth of Asia, CD-ROM, 1998, NISCOM, New Delhi.
- Ghosal S, *Active constituents of *Emblica officinalis*: Part 1 - The chemistry and antioxidative effects of two new hydrolysable tannins, Emblicanin A and B*, *Ind. J. Chem.*, 1996, 35B ; 941-948.
- Dictionary of Indian Medicinal plants*, 1988, p. 340, CIMAP, Lucknow
- Thakur RS, Puri HS, Husain A, *Major Medicinal Plants of India*, Central Institute of Medicinal and Aromatic Plants, Lucknow, 1989, 24-27.
- AOAC Official methods of analysis of AOAC International, 16<sup>th</sup> edition. AOAC International, Suite 400, 2200 Wilson Boulevard, Arlington, Virginia, USA, 1995.
- World Health Organization: *Quality control methods for medicinal plant materials*. Published by WHO, Geneva, 1998.