

MINERAL ANALYSIS OF *AVERRHOA BILIMBI* L. – A POTENTIAL FRUIT

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ABSTRACT

Averrhoa bilimbi L. (Oxalidaceae) is widely distributed and cultivated throughout tropical countries for its fruits. Parts such as leaves bark and fruits are widely used in medicine as a folk remedy for many symptoms. This study provides morphological and biochemical characteristics of half-ripen bilimbi fruits. During present study physical and chemical properties of Bilimbi fruits were studied at half-ripen stage for potential benefits based on its mineral content. Phosphorus content of the fruits was higher at half-ripen stage i.e. $39 \pm 1.7\%$, while in case of minor elements, Molybdenum is present in least amount i.e. 0.04 ± 0.05 ppm. This Chemical study reveals that the fruit is good source of minerals such as Potassium, Phosphorus, Nitrogen, Calcium, Magnesium and Iron suggesting its use as a potential fruit.

Keywords: *Averrhoa*, Bilimbi, Mineral analysis, Oxalidaceae.

INTRODUCTION

Plants are the main source of drugs that being used from the ancient times as herbal remedies for the health care, prevention and cure of various diseases and ailments [1]. *Averrhoa bilimbi* L. of family oxalidaceae, widely cultivated throughout tropical countries for the fruits as they are nutritionally rich. It is commonly called as Bilimbi and medicinally used as a folk remedy for many symptoms. There are many uses in traditional medicine such as fruit conserves or syrups are used for coughs, fevers, and inflammation. Young fruits are waxy shining and green, while mature are yellowish in colour. Fruits are ellipsoid, obovoid or nearly cylindrical, lobed in structure having 4-5 ridges. The size ranges from 5.5 - 7 cm long and upto 2-3 cm in diameter. On an average 7 seeds are present in a fruit. Flowering in Bilimbi starts around mid February to late March and fruiting lasts upto late December to early January. Fruit taste is sour due to high content of oxalic acid, rich in vitamin C, with high level of antioxidants. They are eaten as raw or used in pickles, curries, chutney, and preserves in various dishes. Floral morphological features and variability in two species of *Averrhoa* viz. *A. bilimbi* L. and *A. carambola* L. has been studied [2], while a review to provide an updated categorization of the phytochemical constituents along with the comprehensive list of known ethnobotanical uses, common names and a brief summary of relevant pharmacological activities of *Averrhoa carambola* Linn. has been done [3]. *Averrhoa bilimbi* is a potent plant for future research since it has antidiabetic, antihyperlipidaemic and antibacterial properties [4].

Hence, by keeping this view present study is aimed at determining the physical features and mineral composition of half ripen green fruits of Bilimbi.

MATERIAL AND METHODS

Ten half ripen healthy fruits of *Averrhoa* (bilimbi) were collected during fruiting season from the Botanical garden, Shivaji University, Kolhapur. These fruits were washed thrice under tap water followed by distilled water. Physical features, such as size, colour and weight of fruit; size, number and weight of seed; size and number of ridges; fresh and dry weight; pH were recorded. For acid digestion each fruit was cut into small pieces and dried at 60°C for about 15 days. Dried fruit pieces were crushed in mortar with the help of pestle and dry powder was stored in airtight containers for further analysis. For mineral analysis acid digestion method has been followed [5]. Sodium and Potassium were estimated flame photometrically

following the standard method of flame photometer (Model- Elico, ch-22A), remaining inorganic elements viz. Calcium, Potassium, Magnesium, Iron, Manganese, Zinc, Copper and Cobalt were estimated by using Atomic absorption spectrophotometer (Perkin-Elmer, 3030 A).

RESULTS AND DISCUSSION

Morphometric studies

Studies on morphological features such as colour, length, width, volume, weight, moisture and number of seeds, ridges of fruits and biochemical characteristics endows *Averrhoa bilimbi* fruits as a potential fruit having good amount of antioxidant and minerals (Fig. 1 & Table 1). Data proves that half ripen *Averrhoa bilimbi* fruits are ideal in fruit diet. Mean length of fruit is 6.1 ± 0.38 cm and diameter is 2.1 ± 0.16 cm, while 5 ridges are present per fruit. Number of seeds present per fruit varies greatly, during present studies a mean 7.7 ± 2.45 seeds were found to be present per fruit. Weight of fresh fruit varies greatly with its size, however mean fruit weight is 18.6 ± 2.17 gm, while mean seed weight is 0.16 ± 0.08 gm. Fresh fruits shows $96.9 \pm 0.06\%$ moisture content and pH of the fresh fruit pulp is 2.31 ± 0.2 i.e. acidic due to high oxalic acid content.

Table 1: Physical features of mature fruits of *Averrhoa bilimbi* L.

Sr. No.	Parameters studied	Analysis
01	Length of fruit (cm)	6.1 ± 0.38
02	Diameter of fruit (cm)	2.1 ± 0.16
03	Length/diameter ratio	2.8 ± 0.32
04	Number of ridges	5.0 ± 0.0
05	Length of ridges (cm)	5.7 ± 0.32
05	Width of ridges (cm)	0.4 ± 0.05
06	Weight of fruit (g)	18.6 ± 2.17
07	Moisture Content of fruit (%)	96.9 ± 0.06
08	Dry weight of fruit (g)	0.55 ± 0.05
09	Number of seeds/ fruit	7.7 ± 2.45
10	Weight of seeds(g)	0.16 ± 0.08

(n=10; mean \pm SD)

Mineral composition

Table 2 shows the mineral constituents of half ripen *Averrhoa bilimbi* fruits. Nitrogen, nitrate, phosphorous, potassium, calcium, magnesium, sulphur and sodium were found to be major minerals

while zinc, ferrous, copper, manganese, molybdenum and boron were minor elements. Phosphorus content of the fruit is maximum while nitrate content is lowest in case of major elements, while ferrous is maximum i.e. 33.12 ± 1.34 and molybdenum is lowest (0.04 ± 0.005) in minor elements.



Fig.1: Habit and morphology of *Averrhoa bilimbi* L.

Table 2: Mineral composition of mature fruits of *Averrhoa bilimbi* L.

Sr. No.	Parameters	Analysis
1.	Nitrogen %	2.22 ± 0.05
2.	Nitrate N %	0.07 ± 0.004
3.	Phosphorus %	39.00 ± 1.7

7.

4.	Potassium %	1.52 ± 0.03
5.	Calcium %	0.65 ± 0.1
6.	Magnesium %	0.36 ± 0.05
7.	Sulphur %	0.28 ± 0.05
9.	Zinc ppm	25.53 ± 1.31
10.	Ferrous ppm	33.12 ± 1.34
11.	Copper ppm	0.07 ± 0.015
12.	Manganese ppm	0.05 ± 0.015
13.	Molybdenum ppm	0.04 ± 0.005
14.	Boron ppm	26.75 ± 2.83

(n=10; mean \pm SD)

Averrhoa bilimbi fruit is a good source of minerals such as potassium, calcium, phosphorous and iron. They are low in calorie, sodium and lipids which qualifies it as an excellent source of natural antioxidants and minerals. Physical properties and dimensions of mature *Averrhoa bilimbi* fruits are ideal as green vegetable for human consumption [6]. Overall composition of mineral elements suggests *Averrhoa bilimbi* fruit is good source of minerals and a potential fruit to be popularised for diet.

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