Nutrient Quality Assessment and Post Harvest Fungi of Bush Cherry (*Maesobotrya barteri)* fruit found in Rivers State

[1]Agbagwa S. S., [1]Chuku E. C., [2]Emiri U. N. and [1]Elekwachi, P. S.
[1]Department of Plant Science and Biotechnology,
Rivers State University, Port Harcourt Nigeria
[2]Department of Agricultural Education,
Isaac Jasper Boro College of Education, Bayelsa Nigeria

Abstract
Research on nutrient quality and post-harvest fungi of bush cherry (Mesobotrya barteri)fruit was carried out in the Department of Plant Science and biotechnology, Rivers State University. Parameters assessed were proximate, mineral and vitamin compositions of the fruit. Highest and lowest values of proximate composition was recorded for moisture (85.65±0.55%) and fibre (1.45±0.05%) respectively. Highest value was recorded for calcium (88.5±0.5mg/100g) while sodium gave the lowest value (6.6±0.1mg/100g). Vitamin C content was highest (252.5±2.5mg/100g) whereas vitamin A recorded lowest value (0.1±0.00mg/100g). Phytochemical screening revealed the presence of glycoside, tannin, oxalate, saponin, carotenoid, polyphenol, lignant and flavonoid at varying concentrations. Two fungal organisms (Candida sp and Saccharomycessp) were isolated from spoilt M. barteri fruit. Highest incidence of 60% was recorded for Saccharomyces sp whereas Candida sp had lowest incidence (40%).

Keywords: Bush cherry (*Maesobotrya barteri)*, nutrient quality and post-harvest fungi

INTRODUCTION

Bush cherry (*Maesobotrya barteri*) is a perennial plant that belongsto the Euphorbiaceae familywhich occurs mainly in Tropics (Frantisela, 1998). The plant possesses long broad leaves and bears edible pointed succulent berries that are ovoid in shape (Ogbuagu &Agu, 2008).
Scanty literature has shown that the plant is mostly found in the wild and has different ethnobotanical uses locally which include chewing stick and herbal medicine (Ogunka-Nnoka *et al*., 2016; Okon *et al*., 2016).
Ogbuagu & Agu, (2008).The fruit and seed of *M. barteri* are good sources of vitamins A, C, E as well as thiamine, riboflavin and niacin. The plantis alsorichin mineralsand several other phytochemicals (Shemishere *et al*., 2018).

Though the plant possesses vital nutrient, it is still an under exploited tropical African tree compared to its sister members in the Eurphorbiaceae family that are well researched on (Ogbuagu and Agu, 2008).Industrially,other members of the Euphorbiaceae family such as *Euphorbia myrsinites, E. rigida, E. Stricta*and*Haviea brasilensis*have been exploited for latex (Keay, 1989).

Jatropha species in the *Euphorbiaceae* family have also been utilized for production of biofuel

and its oil utilized in the production of candles and soap (Salehi *et al*., 2019).*M. esculata*has also been employed within the Euphorbiaceae family for the production of several items including garri, flour, tapioca as well as fodder for animals (Akobundu, 1999). Several essential oils have been extracted from different species of Euphorbia for industrial uses including perfume making (Friday*et al*., 2019).

Furthermore, other members of the Euphorbiaceae family have been exploited medically for the treatment and control of different diseases (Keay, 1989). Extensive research have been conducted on the antimicrobial, antioxidant and anti-inflammatory activities of the Euphorbia, Manihot and Jatropha genera (Friday*et al*., 2019).

Studies have also shown the domestication and utilization of other member of the Euphorbiaceae as ornamentals when comparedwithbushcherry that is mostly found in the wild (Onilude *et al*., 2020).Etuk *et al*., (2020) also showed that bushcherry is usually found in the wild and has little or no usage. This was in line with the report of Jongkind, (2016) as Maesobotrya was implicated as a new forest species.

Due to dearth of literature on bush cherry, this research was embarked to evaluate the nutrient quality and associatedpost harvest fungi of*Maesobotrya barteri* fruit found in Rivers State, Nigeria.

MATERIALS AND METHODS

Sample Collection

Healthy and spoilt samples of Bush cherry (*Maesobotrya barteri*) were collected from Rumodogo community in Emohua Local Government Area, Rivers State. They were immediately transported to the Department of Plant Science and Biotechnology, Rivers State University for further studies.

Determination of nutrient components of bush cherry

Healthy fruit samples of bush cherry were sent to the Food Science and Technology Laboratory for the determination of nutrient composition. The methods of AOAC, (2005) was used for the analysis.

Preparation of media

Sterilization of conical flask, slides, Petri dishes and all the equipment needed for the experiment was carried out in the laboratory. The glass wares were sterilized in the oven at 120^{o}C for an hour after washing with soap, while other equipment were surface sterilized with 70% ethanol to reduce microbial contamination (Chuku, 2009). Inoculating loops and scalpels were sterilized by dipping for 20 seconds in 70% ethanol and heated to red hot. The mycological medium used was Sabouraud Dextrose Agar prepared in a conical flask using the standard method. The mouth of the flask was plugged with non-absorbent cotton wool and wrapped with aluminium foil. The conical flask containing the mycological medium was autoclaved at 121^{o}C and pressure of 1.1kg cm-3 for 15 minutes. The molten agar was allowed to cool to about 40 ^{o} C and dispensed into Petri dishes at 15mls per plate and allowed to further cool and solidify.

Isolation of fungi from spoilt bush cherry

The direct plating method of Mehrotra and Aggarwal, (2003) was adopted were 0.5cm of the samples showing visible signs of spoilage by moulds was cut from the healthy portions of the fruits up to the points where rot had established and inoculated onto Sabouraud Dextrose Agar in Petri dishes onto which ampicillin was added to hinder the growth of bacteria in triplicate. The inoculated plates were incubated for 5 days at ambient temperature of 25^{o} C ± 3^{o} C. The entire set up was observed for 7 days to ensure full grown organisms. Pure culture of isolates was obtained after a series of isolations**.**

Identification of fungi from bush cherry

Microscopic examination of fungal isolates was carried out by the needle mount method (Cheesebrough, 2000). The fungal spores were properly teased apart to ensure proper visibility. The well spread spores were stained with cotton blue-in-lacto phenol and examined microscopically using both the low and high power objective. The fungi were identified based on their spore and colonial morphology, mycelia structure and other associated structures using the keys of (Barnett and Hunter, 1998).

Determination of percentage incidence

The percentage incidence of fungal occurrence was determined by the formular stated below (Chuku *et al.*, 2019):

$$\frac{X}{Y} \times \frac{100}{1} = \% \text{ incidence}$$

Where:

X= total number of each organism in a variety

Y= total number of all identified organism in a variety

Statistical analysis

Data obtained were subjected to mean and standard deviation analysis with the aid of SPSS software version 22.

RESULTS AND DISCUSSION

Table 1: Proximate Composition of Bush Cherry

Parameters	Composition (%)
Moisture	85.65±0.55
Ash	2.11±0.01
Lipid	2.53±0.08
Fibre	1.45± 0.05
Carbohydrate	7.18±0.68
Protein	1.09±0.01

Table 2: Mineral Composition

Parameters	Composition (mg/100g)
Calcium	30.5±0.5
Iron	49± 1.00
Magnesium	59.5 ±0.5
Phosphorus	88.5 ±0.5
Potassium	19.5 ±0.5
Sodium	6.5 ±0.1

Table 3: Vitamin Composition of Bush Cherry

Parameters	Composition (mg/100g)
Vitamin C	252.5±2.5
Vitamin A	0.1± 0.00
Thaimin	1.25±0.00

Table 4: Phytochemical Composition of *M. barteri*

Parameters	Composition (%)
Glycoside	0.001±0.00
Oxalate	0.001±0.00
Saponin	0.00±0.00
Tannin	0.18±0.00
Carotenoid	22.54 ± 0.05
Polyphenol	6.04±0.001
Flavonoid	2.35±0.00
Lignant	1.64±0.01

Table 5: Fungal isolates incidence

Isolates	Incidence %
Candida sp	40
Saccharomyces sp	60

The result of *M. barteri* fruit proximate composition presented in table 1 revealed moisture, ash, lipid, fibre, carbohydrate and protein to be present. The current study has shown *M. barteri* fruit to contain valuable nutrients, with varying concentrations. Highest value (85.65±0.55) was recorded for moisture while fibre recorded the lowest value (1.45±0.05). The findings of the present study agree with the report of Ogbuagu and Agu, (2008) as they found the same nutrients in *M barteri* fruit. However, they reported lower moisture content and higher values for other parameters presented in the current study. Achinewhu *et al.*, (1995) reported similar moisture content (83.0±2.0) for *M. barteri* fruit but every other proximate composition value they reported were higher than those recorded in the present study for *M. barteri* fruit.

Shemishere *et al.*, (2018) assessed the leaves of *M. barteri* and showed lower moisture content (50.58+0.43) but higher contents for carbohydrate protein, ash and fibre. In addition, Etukudo and Osim, (2018) also investigated the leaves of *M. barteri* alongside its root and stem. However, they reported lower contents of lipid and moisture for the parts assessed than their counterparts recorded in the present study for *M. barteri* fruits. Proximate composition is essential as it provide energy (carbohydrate and lipid) as well as amino acids (protein) for daily well-being (Hwang *et al.*, 2020).

The mineral composition result of *M. barteri* fruit presented in table 2 revealed calcium, iron, magnesium, phosphorus, potassium and sodium present.The present study has shown that the

fruits of *M. barteri* has appreciable concentration of different mineral elements. Phosphorous recorded highest content (88.5±0.05) while lowest value (6.5±0.1) was seen for sodium. The mineral values in the current study disagree with those reported by Etukudo and Osim, (2018) for the root, stem and leaves of *M. barteri* as they showed lower values than their corresponding elements in the present study. Notwithstanding, Shemishere *et al.*, (2018) reported higher contents of calcium, magnesium, sodium and potassium in *M barteri* leaves. Ogbuagu and Agu, (2008) report on the mineral content of *M. barteri* fruits and the values of potassium, sodium and phosphorus were more than those found in the present study. Nevertheless, they also reported lower value (8.47) of iron compared to the result in the current study. Minerals play a major role in biological and metabolic processes as they are involved as catalyst. Moreso, some give strength to bones (calcium) and support the blood component (iron) (Jongkind, 2016).

Result of vitamin composition presented in table 3 shows the presence of vitamins, C, A and thiamin.The findings of the present study have shown that *M.barteri* has abundant vitamin C concentration (252.5±2.5) than every other tested vitamin.Notwithstanding, early researchers have also implicated other vitamins as well as those recorded in this study to be present in the fruit, and leaves of *M barteri*. The vitamin values of the current study are higher than those reported by Shemishere *et al.*, (2018) for the leaves of *M barteri*. Furthermore, Achinewhu *et al.*, (1995) also reported a lower content of vitamin C (45.4+0.71) for fruits of *M. barteri*. On the other hand, the result of the present study disagrees with the report of Ogbuagu and Agu (2008) as they reported higher vitamin C (361.40) and vitamin A (6.17) than those found in the present study. The high content of vitamin C in *M. barteri* makes it a good choice of fruit for immune system support as vitamin C aid the immune system to fight invading pathogenic organism (Wardlaw and Kessel, 2002).

The phytochemical composition result of *M. barteri* fruit presented in table 4 reveals glycoside, oxalate, saponin, tannin, carotenoid, polyphenol, flavonoid and lignant to be present. The phytochemical screening of the current study has revealed a variety of Phytochemicals present in the fruit of *M barteri* carotenoid recorded highest content (22.45±0.05) while lowest content (0.00±0.00) was recorded for saponin. The activity of these phytochemicals in plant defense mechanism cannot be overemphasized as they have been known to have antimicrobial potential against bacterial and fungi pathogens (Udo *et al.*, 2017). Shemishere *et al.*, (2019) also found all tested phytochemicals to be present in leaf and associated their presence to the antioxidant nature of *M. barteri*.Furthermore, Etukudo and Osim, (2018) also reported similar phytochemicals in *M. barteri*. Stem, leaf and root. However, they reported higher values than those outlined in the current study.

The result of fungi isolates presented in table 5 revealed *Candidasp* and *Saccharomycessp* to be associated with *M. barteri* fruit spoilage.The present study has also shown that *M. barteri* fruits could be attacked and spoilt by pathogenic organisms. *Candida* sp and *Saccharomyces* sp isolated recorded incidence of 40% and 60% respectively. There is dearth of information on micro-organisms associated with the spoilage at *M. barteri*. Fruit. This could be as a result of its unexploited nature (Jongkind, 2016). The plant as reported by some researchers is yet to be domesticated as it is predominantly found in the wild.

Furthermore, it is reported that *M. barteri* is among the undergrowth plant species in natural forests. (Bassey, 2012). Etuk *et al.*, (2020), implicated the menace of grape and berry fruit

spoilage to different genera of fungi. Chuku *et al*., (2020) reported the action of *Aspergillus* sp, *Slerotium* sp and *Cryptococcus* sp on the spoilage of exotic grape (*Vitis vinifera*). Generally, the action of these organisms affect the appearance, taste and marketability of fruits (Chuku and Emiri, 2019).

CONCLUSION

Bush cherry (*M. barteri*) is endowed with vital nutrients that are essential for healthy living. However, the fruit of the plant still faces the challenge of spoilage by microorganisms. More research should be carried out on *M. barteri* as there is dearth of information about the plant.

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