
**NUTRIENT QUALITY AND ASSOCIATED SPOILAGE FUNGI OF ENGLISH PEAR
(*Pyruscommunis* L)**

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<http://doi.org/10.35410/IJAEB.2019.4483>

ABSTRACT

Studies on the nutrient quality and associated spoilage fungi of English pear (*Pyruscommunis*) were carried out in the Department of Plant Science and Biotechnology Rivers University, Port Harcourt. Healthy and spoilt samples of *P. cummunis* were purchased from the fruit garden market in D. Line, Port Harcourt and used for the study. Results of Proximate analysis revealed the presence of moisture, ash, lipid, carbohydrate, fiber and protein. It was also observed that all the parameters assessed were higher for the spoilt samples except for moisture (87.51 ± 0.001) and carbohydrate (10.02 ± 0.002) which were higher in healthy fruit samples. The mineral contents indicated higher values for all parameters (calcium, phosphorus, potassium, iron, sodium and magnesium) in the healthy samples. However, vitamins A, C, and thiamine were available in higher quantities in healthy fruit samples with equal values recorded for niacin (0.5 ± 0.003) for both healthy and spoilt samples. Anti-nutrient and phytochemical investigations revealed phytate, oxalate, saponin, tannin, carotenoid, polyphynol, flavonoid and lignin to be available in appreciable amounts. Nevertheless, two spoilage fungi viz: *Aspergillusflavus* and *A. niger* were isolated fromfrom spoilt fruit samples and implicated to cause spoilage as they both proved pathogenic when inoculated into healthy samples of *P. communis*. Higher percentage incidence (95%) was recorded for *A. flavus* while *A. niger* had 5%.

Keywords: *Pyruscommunis*, nutrient quality, spoilage fungi.

1. INTRODUCTION

Pyruscommunis commonly known as English pear is an important member of the Rosaceae family and often cherished for its unique taste (Dzhangaliev *et al.*, 2003). The plant holds its origin and distribution in Europe with other sub species such as *P. communis* subsp. *Gharbiana* (T.) Maire and *P. communis* subsp. *Marmorensis* (Trab.) Maire being reported in Algeria and Morocco (Silva *et al.*, 2014; USDA, 2012).

The tree is said to be deciduous, possessing alternatively arranged simple ovate leaves. Flowers are borne terminally and represent a corymbose inflorescence while fruits are pear shaped containing black seed (Orwa *et al.*, 2009; AOSA 1993). *P. communis* has a wide range of uses both in the medicinal and industrial sector. More so, its fruit has a wide range of consumption including in the form of juice and is peculiar for its nutritional quality (Gonsalves, 2002; Xie *et al.*, 2007).

Extensive studies on the nutritional composition of the seed, pulp and peel of *P. communis* fruit were carried out by Mohammed *et al.*, (2010). They revealed the presence of several proximate and mineral constituents such as moisture, lipid, carbohydrate, fibre, protein, phosphorus, magnesium, potassium, sodium and calcium. Furthermore, they implicated many other amino acids and anti-nutritional components in the seed and pulp of *P. communis*. Their study was supported by the report of Hussain *et al.*, (2015) as they indicated the availability of these nutritional components in *P. communis*.

In addition, *P. communis* is a good source of other essential components such as vitamins (A, C, E, K, B12, B3 and B5), phytochemicals (flavonoids, tannin, anthocyanin, alkaloids, triterpenes and oxalate) and other anti-nutritional parameters (Li *et al.*, 2012; Rychilnska&Gudej, 2003; Milind&Arzoo, 2016; Yim& Nam, 2016).

The report of Xie *et al.*, (2007) also showed that the juice made from *P. communis* is a good source of proximate, mineral and vitamin. More so, literatures have shown the relevance of these nutritional components for healthy living (Vadivel&Janardhanam, 2015; Senser *et al.*, 1999).

Nevertheless, this wonderful fruit is faced with the challenge of spoilage as they are prone to attack by microorganisms including fungi (Parveen *et al.*, 2016; Joubert& Doty, 2018).

Muscat *et al.*, (2017) implicated several fungal organisms to be responsible for the deterioration and spoilage *P. communis* fruit and they are viz: *Cladosporiumramotenellum*, *Alternariaarborescens*, *Penicilliumlanosum*, *P. expansum* and *Aspergillusydwii*.

Wenneker *et al.*, (2017) also reported *Fibulorhizoctoniapsychrophila* to be the spoilage agent of the pear fruit causing lenticel spot. *Pyrigemmulaaurantiaca* was also implicated as prevalent organism of grapevine trees including *P. communis* (Magyar *et al.*, 2011).

Thus, this research was carried out to profile the nutritional quality and associated fungi of *P. communis* sold in Port Harcourt metropolis.

2. MATERIALS AND METHODS

Sample Collection

Samples of healthy fruits of *P. communis* and partially rotted fruits were bought from the Fruit Garden Market at D. Line Diobu Port Harcourt and brought to the Department of Plant Science and Biotechnology and sent to the Plant Pathology Laboratory for further studies.

Mycological studies

Preparation of mycological medium

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°C for an hour after washing with soap, while other equipment were surface sterilized with 70% ethanol to reduce microbial contamination (Agrios, 2005). 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° C and pressure of 1.1kg cm⁻³ for 15 minutes. The molten agar was allowed to cool to about 40 ° C and dispensed into Petri dishes at 15mls per plate and allowed to further cool and solidify.

Isolation of fungi from partially rotted *Pyruscommunis* fruits.

One gram of 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° C ± 3° C (Baudoni, 1988; Chuku, 2009; Samson *et al*, 1981). The entire set up was observed for 7 days to ensure full grown organisms. Pure culture of isolates were obtained after a series of isolations.

Identification of fungal organisms from *Pyruscommunis*

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 (Samson *et al*, 1981 and Olds, 1983).

Pathogenicity studies

Pathogenicity studies was carried out on *P. communis* to check if the fungi isolated from the rotted fruits were capable of causing spoilage on healthy fruits samples. The methods of (Agrios, 2005;Trigiano, 2004) was basically followed. The fungal isolates were introduced into healthy fruits and observed for seven days. The set up was monitored regularly for growth.

Determination of nutrient components of fruits of *Pyruscommunis*.

Healthy and spoilt fruit samples of *P. communis* 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.

Determination of percentage incidence

The percentage incidence of fungal occurrence was determined by the formular stated below (Nnaji and Rao, 2017):

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

Where:

X= total number of each organism in a variety

Y= total number of all identified organism in a variety

3. RESULTS AND DISCUSSION

Table 1: Proximate composition of healthy and spoilt fruit of *P. communis*

Parameters	Healthy (%)	Spoilt (%)
Moisture	87.51±0.001	80.4±0.004
Ash	0.14±0.015	0.25±0.021
Lipid	0.05±0.004	0.06±0.003
Carbohydrate	10.02±0.002	8.5±0.032
Fibre	0.05±0.001	0.15±0.001
Protein	2.22±0.012	10.63±0.002

Table 2: Mineral composition of healthy and spoilt fruit of *P. communis*

Parameters	Healthy (100mg/g)	Spoilt (100mg/g)
Calcium	12.2±0.003	10.5±0.006
Phosphorus	10.1±0.021	8.1±0.054
Potassium	110±0.023	95±0.006
Iron	4.5±0.001	4.2±0.001
Sodium	9.5±0.005	8.4±0.012
Magnesium	8.4±0.013	4.8±0.003

Table 3: Vitamin composition of healthy and spoilt fruit of *P. communis*

Parameters	Healthy (100mg/g)	Spoilt (100mg/g)
Vitamin A	5.2±0.013	5.0±0.042
Thiamin	1.2±0.033	1.0±0.014
Naicin	0.5±0.003	0.5±0.023
Vitamin C	16.5±0.021	16.0±0.001

Table 4: Anti-nutritional and phytochemical composition of healthy fruit of *P. communis*

Parameters	Healthy (100mg/g)
Phytate	0.02±0.032
Oxalate	0.1±0.010
Saponin	0.05±0.021
Tannin	0.01±0.011
Carotenoid	0.52±0.016
Polyphynol	0.04±0.023
Flavonoid	0.35±0.041
Lignin	0.85±0.001

Table 5: Fungi isolates and their percentage incidence

Isolates	Percentage incidence (%)
Aspergillusflavus	95±0.003
Aspergillusniger	5±0.012

The result of proximate composition presented in Table 1. Showed the availability of moisture, ash, lipid, carbohydrate, fiber and protein both in the healthy and spoilt samples of *P. communis*. However, higher values of moisture (87.51± 0.001) and carbohydrate (10.02 ± 0.002) were

recorded for the healthy samples while all other parameters were higher in the spoilt sample. The proximate result of this study disagrees with that reported by Mohammad *et al.*, (2015) as they revealed higher values compared to their equivalents in this study. Nevertheless, the moisture contents of the present study were higher than those they reported for the pulp, seed and peel of *P. communis*. Although it agrees with the 83.1 ± 2.13 reported by Hussain *et al.*, (2015). Zhang, (2015) reported lower protein value (0.22) and similar value of carbohydrate (10.0) for *Pyrus pyrifolia* juice.

Table 2. Outlined the mineral composition of *P. communis* and revealed that the healthy fruit had higher contents of calcium, phosphorus, potassium, iron, sodium and magnesium at 12.2 ± 0.003 , 10.1 ± 0.021 , 110 ± 0.023 , 4.5 ± 0.001 , 9.5 ± 0.005 and 8.4 ± 0.013 respectively compared to their equivalents in the spoilt samples. The magnesium value for the healthy sample in this study is in line with the 8.04 ± 0.52 reported by Mohammad *et al.*, (2015). However, other mineral values in this study are not consistent with their respective correspondents they reported. In addition, the iron value of this study concurs to the 4.32 ± 0.31 reported by Yim & Nam, (2015) and they also reported same mineral parameters but at higher concentrations.

Furthermore, the vitamin composition of *P. communis* represented in Table 3. Implicated higher values for Vitamins A, C and thiamine in the healthy samples than those recorded for the spoilt samples. However, equal values for niacin were recorded for both healthy and spoilt samples for *P. communis*. The report of Milind & Arzoo, (2016) agrees with the vitamin parameters profiled in this study. Chen *et al.*, (2005) reported lower values of Vitamin C and thiamine in the juice content of *Pyrus* fruit.

Anti-nutritional and phytochemical components arrayed in Table 4. revealed several components such as phytate, oxalate, saponin, tannin, carotenoid, polyphenol, flavonoid and lignin to be available in appreciable amounts in *P. communis*. Hussain *et al.*, (2015) and Mohammed *et al.*, (2015) implicated phytate, oxalate, hydrocyanic glucosides and nitrate to be present in *P. communis*. Occurrence of flavonoid, tannin and alkaloid were also indicated in the research of Sharma *et al.*, (2015).

Proximate, mineral, vitamin and anti-nutritional contents are essential for daily living. They contribute to the supply of amino acid (protein), energy (lipid and carbohydrate), reduce cholesterol level (fiber) and aid in adequate biochemical, physiological and metabolic processes (Ladeji *et al.*, 2004; Pugatenthi *et al.*, 2004). Phytochemicals have been reported by early researcher to possess antimicrobial potential (Kaur & Arya, 2012).

Two fungi organisms (*Aspergillus flavus* and *A. niger*) were isolated from spoilt *P. communis* (Table 5.) and proved to be pathogenic when inoculated into healthy fruit sample. While *A. flavus* had higher incidence (95%), *A. niger* recorded a percentage incidence of 5%. Earlier studies had shown the susceptible nature of *P. communis* to fungi (Wenneker *et al.*, 2017; Magyar *et al.*, 2011). Moreso, the fungal isolates from this study agrees with Muscat *et al.*, (2017) as they also implicated *Aspergillus* species to cause spoilage of *P. communis* fruit. The activities of these microorganisms were evident in the unpleasant appearance and foul smell of the spoilt fruits; this in turn affected their marketability.

4. CONCLUSION

Pyruscommunis fruit is endowed with vital nutrients which cut across proximate, mineral, vitamin, anti-nutritional and phytochemical divisions. But it is attacked and infected spoilage organisms. Therefore, proper hygienic measures should be adopted when by farmers and vendors. More so, consumers should ensure to wash properly before eating.

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