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Pathological Evaluation and Nutritional Composition of Golden Melon (*Cucumis Melo*)

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Abstract

Studies on the pathological evaluation and nutritional composition of golden melon was carried out in the Plant Pathology and Food Science and Technology Laboratories in the Rivers State University. The freshly harvested fruits of the golden melon had high amount of moisture (58±0.04), sucrose, total solid, lipid with very low ash (0.56±0.00). Mineral composition analysis also revealed high amount of calcium (98.5±0.01), moderate quantity of potassium, and low amount of phosphorus (21.4±0.00). Vitamins A and C were also present in the fruits. Other components found were lactic acid and saponnins which occurred in minute quantities.Pathological evaluation of the associated fungi showed that five different fungi with varying degrees of incidence were associated with the spoilage of the fruits of golden melon. These fungi were *Botrytis cinerea* (60%), *Aspergillus flavus*(30%), *Aspergillus niger* and *Aspergillus tamari* (5%) respectively while Muccor species recorded the highest incidence (70%). However, all the fungal isolates were found to be pathogenic causing soft rot characterized by oozing of water with offensive odour.

1. Introduction

Cucumis melo L. commonly known as golden melon and honeydew melon is a member of the Cucurbitaceae family alongside other cucurbits like water melon (*Citullus lanatus*), cucumber (*Cucumeropsis mannii*), pumpkin (*Telfairia occidentalis*), etc (Robinson and Decker-Walters, 1999). The common names (golden melon and honeydew melon) were derived from the fruit colour and aroma respectively. The honey dew aroma of the fruit is due to the presence of (Z,Z)-3,6-nonadien-1-ol and phenylethyl alcohol (Perry *et al*., 2009).The plant has an extensive rooting system, an aerial stem, simple leaf, trailing and creeping habit. The fruit is globular in shape, yellow to gold in colour and attains a size of 12-16cm. The fruits in turn possess a spherically elongated white seeds (Ajuru and Okoli, 2013).

The Cucurbitaceae family has been implicated by so many researchers to possess high nutritional and medicinal value (Jeffery, 1990). The research of Oluwatoyin and Oluwaseun (2014), showed that the seeds of *C. melo* contains considerable amount of moisture, ash, fibre, fat, protein and carbohydrate. More so, they further revealed the presence of calcium, magnesium, potassium, sodium, copper, manganese, zinc and iron to be present in the seeds as minerals. It has also been reported that the seed oils contains physiochemical properties (Petkova and Antova, 2015; Yanty *et al*., 2008). Early works have also shown that the fruits are rich in vitamins including riboflavin, A, C, folic acid and thiamine (Eitenmiller *et al*., 1985; Laur and Tran, 2011). Alam (2016), reported the phenolic contents and antioxidant activities of *C. melo* seeds.

Microorganisms implicated by most researchers on *C. melo* are mostly bacteria including *Samonella spp* and *E. coli* (Ukuku *et al*., 2005). However, *Candida* spp and *Leuconostoc mesenteroides* were also reported to be associated with fresh-cut *C. melo* fruits (Zhang, 2013). Adebajo (1993), isolated 19 microorganisms responsible for the spoilage of soft melon ball snacks under tropical conditions in the humid western part of Nigeria and it implicated several fungi organisms viz: *Rhizopus arrhizus, R. nigricans, Aspergillus flavus, A. ochraceus, A. tamarii, A. niger, Mucor fragilis* and *Penicillium citrinum*.

It is based on the little information on the nutritional composition and fungi flora of *C. melo*, this researched was carried out.

2. Materials and Methods

Sample Collection

Samples of healthy fruits of *Cucumis melo* were bought from fruit vendors at Magboro Junction, Ogun State and brought to the Department of Plant Science and Biotechnology Laboratory Rivers State University, where it was observed for spoilage.

Determination of nutrient components of *Cucumis melo*

Healthy samples of *Cucumis melo* were sent to the Food Science and Technology Laboratory for the determination of nutrient compositions of the entire fruit comprising the pulp and the seeds. The methods of AOAC (2005) was used for the phytochemical analysis.

3. 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 using the standard methods 9 Agrios, 2005). The mycological medium used was Sabouraud Dextrose Agar prepared in a conical flask using the standard method(Agrios, 2005).

Isolation of fungi from *Cucumis melo*

Isolation of fungi was done using the classical phytopathological method whereby small samples of *Cucumis melo* were cut from points showing visible signs of spoilage to the healthy portions and inoculated onto Sabouraud Dextrose Agar in Petri dishes onto which ampicillin was added to hinder the growth of bacteria. The inoculation was done in triplicate. The inoculated plates were incubated for 5 days at ambient temperature of 25^{o} C $\pm$ 3^{o} 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 isolationsand the extent of fungal growth was determined with a meter rule and converted to percentages according to the methods of (Onuegbu, 2002).

Identification of fungal organisms from *Cucumis melo*

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 *Cucumis melo* to check if the fungi isolated from *C.melo* were capable of causing spoilage of the fresh samples. The methods of (Agrios, 2005, and Trigiano, 2004) were basically followed. The fungal isolates were introduced using a sterile inoculating loop through a “V” shaped cut on the healthy*C.melo* and observed for seven days. The set up was monitored daily for growth.

4. Results and Discussion

Table 1: Proximate composition of *C. melo*

Parameters	Percentage composition (%)
Moisture	58 ± 0.04
Ash	0.56 ±0.00
Lipids	15.45 ±0.01
Carbohydrates	10.98 ±0.03
Fibre	2.51 ±0.00
Proteins	12.5 ±0.02
Total solid	18.84 ±0.01
Sucrose	31.12 ±0.03

Table 2: Phytochemical compositions of *C. melo*

Parameters	
Calcium (mg/100g)	98.5 ±0.01
Potassium (mg/100g)	48.6 ±0.05
Phosphorus (mg/100g)	21.4 ±0.00
Sodium (mg/100g)	34.2 ±0.04
Vitamin A (I. U.)	0.91 ±0.02
Vitamin C (mg/100g)	12.5 ±0.01
Lactic acid (mg/100g)	0.96 ±0.03
Saponin (mg/100g)	2.5 ±0.00

Table 3: Fungal isolates andtheir incidence of *C. melo*

Isolate	Percentage incidence (%)
Botrytis cinerea	60
Aspergillus flavus	30
A. niger	5
A. tamarii	5
Mucor spp	70

The proximate result of *C. melo* as presented in Table 1. revealed the presence of moisture (58 ± 0.04), ash (0.56 ±0.00), lipid (15.45 ±0.01), carbohydrate (10.98 ±0.03), fibre (2.51 ±0.00), protein (12.5 ±0.02), total solid (18.84 ±0.01) and sucrose (31.12 ±0.03). The values for moisture and carbohydrate in this study are higher than that reported by Oluwatoyin and Oluwaseun (2014) for *C. melo* seeds. Meanwhile, the carbohydrate values of *C. manni* and *C. melo* reported by other researchers were higher than10.98 ±0.03 reported in this study (Fokou *et al*., 2004; Loukou *et al*., 2007).

The mineral, vitamin and phytochemical results of *C. melo* presented in Table 2. showed that the fruits contained calcium (98.5 ±0.01), potassium (48.6 ±0.05), phosphorus (21.4 ±0.00), sodium (34.2 ±0.04), vitamin A (0.91 ±0.02), vitamin C (12.5 ±0.01), lactic acid (0.96 ±0.03) and saponin (2.5 ±0.00). The mineral result of this study disagrees with that reported by Oluwatoyin and Oluwaseun (2014), as lower values of 0.023, 1.04 and 1.77 were reported for calcium, potassium and sodium respectively.

The result of fungal isolates presented in Table 3. implicated five organisms namely *Botrytis cinerea, Aspergillus flavus, A. niger, A. tamari* and *Mucor spp*. The pathogenic ability of these organisms proved positive as they were able to cause spoilage when inoculated into fresh healthy samples of *C. melo*. *Mucor* recorded the highest percentage incidence of 70%. This was immediately followed by *Botrytiscinerea* (60%) and *Aspergillus flavus* (30%). Nonetheless, the lowest percentage incidence of 5% was seen for both *A. tamari* and *A. niger*.

The fungi isolates of this current study disagrees with that reported by Zhang (2013), as *Candida* was the only fungus isolated in that research. However, the fungal result of this present study is in line with the report of Adebajo (1993) and Chuku and Adeleke (2008), as all the fungal isolates excluding *Botrytis cinerea* were implicated to be responsible for the spoilage of soft melon ball snack. Nevertheless, earlier studies have also shown that the isolates of this study have been responsible for the spoilage of other tropical fruits including *C. melo* relatives in the Cucurbitaceae family.However, it is important to note that fungal infection on plants and plant products are greatly influenced by factors such as handling, transportation and processing methods (Okaka, 1997). In order to reduce the rate contamination by fungi, proper care must be taken to ensure that products are well handled and other related factors that could lead to contamination curbed.

5. Conclusion

The fruits of *C. melo* are endowed with so many nutritional values as implicated from the proximate composition analysisthat can support and boost a healthy living when incooperated into diet. The plant is also attacked by fungal organisms that leads to its deterioration and spoilage. Hence proper sanitary measure should be employed when handling the fruits.

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