Post-Harvest Fungi Associated with African Pear (*Dacryodes edulis*) and Biochemical Changes Induced by rot Fungi (No. 057)

[1]Emiri, U. N. and [2]Chukunda F.N
[1]Department of Agricultural Education, Isaac Jasper Boro College of Education, Sagbama, Bayelsa State.

[2] Department of Forestry & Environment, Rivers State University Nkpolu-Oroworukwo, Port Harcourt.
Corresponding author's email. ucheemiri@gmail.com

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INTRODUCTION

- The African Pear *Daocryodes edulis* also called bush butter is one of the numerous indigenous African tropical fruit trees which extent from south-western Nigeria to Congo, Angola and Zambia. (*Lam et al*., 2006).

- It is rich in protein, lipid, ash and carbohydrate content. The dry mashed fruit pulp has various multipurpose uses such as feed, medicine, livestock and as source of high quality non-greasy natural oil with possibly numerous industrial uses (Okorie, 2006).

- Generally, fruits are vegetables are stored for a period of time following harvest. Disease or related losses may occur no matter how short the storage period. One of these most devastating post-harvest diseases is caused by fungi.

- This study was aimed at isolating and identifying fungi associated with *D. edulis,* test for their virulence, evaluate the biochemical changes on the fruits and determine the effects of the fruits oil extract in the control of fungi mycelial growth.

MATERIALS AND METHODS

Healthy *D.edulis* Fruits

Fungal Infected *D.edulis* Fruits

- **Isolation and Identification of Fruit-borne Pathogen:** Infected seeds of *D.edulis* were isolated by methods described by Chukunda (2014).
- **Pathogenicity Test:** Healthy fruits were inoculated with 7 days old fungal cultures, while the controls were without fungi, incubated at 25°C for 2 weeks, after which the fruits were cut through and examined for rot (Chukunda, 2014).
- **Biochemical Analysis of Infected and Uninfected *D. edulis* Fruits:** Protein, starch, sugar, carbohydrates, moisture, ash and dry matter were investigated quantitatively in both healthy and inoculated fruits.

- **Starch and Sugar:** The individual sugars were quantitatively determined by the dilution process of Okoye and Ugwu (2008).
- **Protein:** The protein content of *D.edulis* was quantitatively estimated by determining the total Nitrogen as described by (A.O.AC, 2004).
- **Carbohydrate:** The Carbohydrate content was determined by the methods (A.O.A.C, 2004), summarised by the formular below.

$$Carbohydrate = \frac{25 \times \text{absorbance of sample}}{Absorbance \text{ of standard}} \times \frac{100}{1}$$

Ash: Ash was determined by the formular (AOAC, 2004).

$$\text{Ash} = \frac{Final \text{ weight - Initial weight}}{Weight \text{ of the Sample}} \times \frac{100}{1}$$

- **Organic Acid:** Analysis of total plant acids in were carried out using the method of Amita *et al*, (2020).

RESULTS

Table 1: Percentage Frequency of Occurrence in Infected Fruits of African Pear (*D.edulis)*

S/N	Fungal Isolates	% Frequency in *D.edulis*
1.	*Botryodiplodia theobromae*	40.00
2.	*Rhizopus stolonifer*	36.00
3.	*Colletotrichum gloeosporoides*	60.00
4.	*Fusarium pallidoroseum*	48.00
5.	*Penicillum expansum*	5.00
6.	*Botrytis cinerea*	5.00
7.	*Aspergillus niger*	26.00
8.	*Aspergillus flavus*	48.0
	LSD (P≤0.05)	0.024

C. gloeosporoides (60%) had the highest frequency of occurrence while *Rhizopus stolonifer* (36%) had the least occurrence.

Table 2: Changes in Nutrient Contents of *D. edulus* Fruits Infected with Test Fungi at 28 ± 2°C for 5 days.

S/N	Fungal Isolates	Biochemistry Composition (%10/10) Carbohydrates	Proteins	Moisture	Dry mater	Ash	Sugar (fructose)
1.	*Aspergillus niger*	6.5	16.6	12.7	40.6	10.2	20.5
2.	*Aspergillus flavus*	8.7	19.5	15.6	42.5	14.6	18.8
3.	*Rhitopus stolonifer*	8.5	35.8	29.4	85.2	15.4	20.6
4.	*Fusarium pallidra*	10.7	30.4	20.6	84.5	12.8	22.4
5.	*Botryodiplodia theobromue*	8.8	25.6	19.4	60.9	10.5	16.2
6.	*C. gloeosporodis*	5.3	31.2	20.3	66.5	11.7	16.9
7.	*Penicillum expansum*	4.8	28.6	18.6	50.7	12.3	21.8
8.	*Botrytis cinerea*	4.6	20.8	15.6	54.3	10.8	18.5
9.	Control	13.5	30.8	13.8	92.5	10.5	15.8
	LSD (P≤0.05)	**0.016**	**0.025**	**0.021**	**0.019**	**0.013**	**0.018**

Table 3: Qualitative Estimation of Fruits Extracts of Uninfected and *Infected D. edulis*

S/N	Plant Acids	Quality (µg/100G Fruits) African Pear Uninfected	(D. edulis) infected	t Value
1.	Chlorogenic acid	9.45 ± 0.02	12.35 ± 0.02	-217.25^{NS}
2.	Ascorbic acid	4.20 ± 0.03	8.10 ± 0.03	-15.10^{NS}
3.	Citric acid	2.35 ± 0.03	3.80 ± 0.02	-16.53^{NS}
4.	Malic acid	1.03 ± 0.04	3.30 ± 0.03	-65.87^{NS}
5.	Salicyclic acid	7.25 ± 0.04	10.25 ± 0.02	70.16^{NS}
6.	Oxalic acid	3.96 ± 0.03	2.74 ± 0.02	77.61 **
	LSD (P≤0.05) 0.022	**0.022**	**0.017**	

Table 4: Effect of Total Fruit Extracts on the Growth of Fungal Rot Isolates of African Pear *D. edulis*

S/N	Fungal Isolates	Fruit Extracts (PPM) 0. Control	20	60	100	LSD $_{(0.05)}$
1.	*A. niger*	1.30	3.20	2.00	1.30	0.44
2.	*A. flavus*	0.80	1.80	1.20	0.25	0.32
3.	*R. Stolonifer*	2.35	3.40	1.30	0.15	0.69
4.	*F. pallidoroseum*	1.20	2.20	2.00	0.00	0.53
5.	*B. theobromae*	0.25	1.60	0.30	0.00	0.20
6.	*C. gloeosporoides*	1.30	2.40	1.20	0.20	0.44
7.	*P. expansum*	0.45	1.60	0.10	0.00	0.15
8.	*B. cinerea*	0.26	1.50	0.20	0.05	0.30
	LSD (P≤0.05) 0.022	**0.018**	**0.015**	**0.013**	**0.189**	

DISCUSSION

- The results of investigation on fungi incidence of *D.edulis* sampled, implicated *Aspergillus species, R. stolonifer, B. theobromae C. gloeosporoides,* and *Botrytis cinerea* as shown in table 1.
- Most of these fungal pathogens identified have being reported by earlier researchers. Emiri and Chuku (2017) implicated some of these fungal isolates to be responsible for soft rot of vegetable crops.
- The result of the nutritional analysis of *D. edulis* inoculated with the test fungi caused significant changes in the nutrient compositions (Table 2). There was significant decrease in protein,carbohydrates and dry matter content relative to the control (uninfected).
- There was an increase in moisture and sugar content.
- The decrease in carbohydrates confirms the findings of Sanyolu (2014), Emiri & Enaregha (2020) on seeds of *Irvingia gabonensis*.
- Obviously, higher sugar and moisture level observed in infected tissues of *D.edulis* was as a result of starch hydrolysis by the activation of amylase in the diseased tissue of the fruits which consequently resulted into accumulation of moisture.

DISCUSSION CONTD.

- Quantitative estimation of fruits extracts showed higher amount of polyphenolic compounds in infected than uninfected tissues of *D.edulis* as seen in table 3. Metabolic activities of enzymes may have triggered an increase in Phenolic compounds.
- Treatment with fruit extract of *D.edulis* on the growth of fungal isolates (test fungi) indicated significant reduction of growth of test fungi at higher concentration of fruit extract as shown in Table 4. It therefore suggests, the fruit extract inhibited the growth of test fungi. This confirms the assertion of Eugene *et al* (2006), Chukwu and Emiri (2019) who reported that extracts of many higher plants had antifungal properties under laboratory trials.

CONCLUSION

- The effect of fungal isolates of fungi on some biochemical parameters of the fruits showed significant decrease in protein, carbohydrates and dry matter, while moisture and sugar content increased. The results obtained confirmed the antifungal activities of fruit extracts as a better alternative to toxic fungicide given that it's eco-friendly.

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