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PHYTOCHEMICAL PROPERTIES AND ANTIBACTERIAL EFFECTS OF *AFRAMOMUM SCEPTRUM, CHRYOSOBALANUS ICACO* AND *PIPER GUINEENSE* SEEDS

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ABSTRACT

The study investigated phytochemical properties and antibacterial effects of some Nigerian plant seeds used as spices. Nine extracts were derived from the plant seeds. The phytochemical tests results showed that alkaloids and flavonoids were present in A. sceptrum extracts and absence of anthraquinones, saponins, cardiac glycosides, steroids, terpenoids and carotenoids. Piper guineense also showed the presence of flavonoids and alkaloids while absence of carotenoids. Chryosobalanus icaco contained most of the phytochemical compounds with exception of terpenoids, carotenoids and anthraquinones. Piper guineense water extract was active against Acinetobacter baumannii and Enterococcus sp. All extracts obtained from Chryosobalanus icaco were active against Enterococcus spp. and Streptococcus sp. with inhibition zone of 15mm and 18mm for ethanol extract and 17mm and 19mm for methanol extract and the highest zone of inhibition was observed for water extract (20mm) of same plant. The bacteria tested were not sensitive to Aframomum sceptrum. The minimum inhibitory concentration for active extracts were 12.5mg/ml for C .icaco and 25mg/ml for P. guineese. Chryosobalanus icaco and Piper guineese had phytochemical and antibacterial properties which could be exploited for formulation of medicines for bacterial infections.

KEYWORDS: *Aframomum sceptrum, Piper guineese, Chryosobalanus icaco* Phytochemical, antibacterial, *Acinetobacter baumannii*.

INTRODUCTION

Aframomum sceptrum (Oliv. and Hanb.) K. Schum. is among the local spices consumed in South-south Nigeria. It is commonly known as Guinea grains, grains of paradise, or black amomum in English (Burkill, 1985). *Aframomum sceptrum* is a member of the family Zingiberaceae, a terrestrial rhizomal herb with over 1400 species conveyed in over 50 genera (Hepper, 1996). They are generally found in tropical regions of Asia and Africa. They are closely related to the *Aframomum* species of Asia and in fact a few species of *Aframomum* are utilized in ethnomedicine in South-East Asia (Perry, 1980). A few species from the genus *Aframomum* are major nourishment plants and their antibacterial, antiparasitic, antiviral and antifungal properties have been published (Cousins and Huffman, 2002). The entire plant has been said to be utilized for ethno dietary, spiritual and medicinal purposes. Locally seeds are removed from pods, fermented, dried and powdered and used as spices for food preparation.

CHRYSOBALANUS ICACO

Chrysobalanus icaco commonly called the cocoplum, paradise plum is a low shrub or bushy tree found close to ocean shorelines and inland all through tropical nations of Africa, America, the Caribbean, Southern Florida and the Bahamas. The fruit is consumable, with almost bland to gently sweet flavour, and in some cases utilized for jam. It contains a five- or six-ridged brown stone with consumable white seed. It is a member of Chrysobalanaceae family and have been utilized in conventional medication in a few nations; eminently, Mexico and Brazil, where it is utilized to treat different illnesses including leucorrhoea, bleeding, hypoglycemia, diabetes, and antiangiogenic (Alves,and Perrelli, 2012; Arajo-Filho *et al.*, 2016). *Chrysobalanus icaco* stands out for its wholesome and ethnopharmacological properties since the leaves and fruits contained notably quantities of phytochemicals such as pomolic acids, which activates apoptosis in HL-60 leukemia cells (Fernandes *et al.*, 2007).

PIPER GUINEENSE

Piper *guineense* Schum and Thonn. is a perennial plant common in the tropical areas of the world . It is ordinarily found in damp places within the evergreen rain-forests, timberland edges, exhibition woodland along rough streams and develops up to 750-1650 m tall and a member of the family Piperaceae which has over 700 species. The plant is commonly called Ashanti pepper, Guinea cubeb, black pepper and false cubeb (Trease and Evans, 2002; De Vos, 2010). African dark pepper is utilized as a spice in cooking, for killing insects , for home grown medications, and as fragrance in cosmetic industries. Piper *guineense* is utilized for the treatment of cough, dental caries, bronchitis, gastrointestinal infections, rheumatism, sickle cell anemia and respiratory illnesses such as asthma (Ashok and Upadhyaya, 2020; Imaga, 2013; Agbor and Naidoo, 2015; Gbekley *et al*., 2017). Water extract of the dehydrated fruit induce testicular and epididymal properties in rats (Mbongue *et al*., 2005), whereas Uhegbu *et al*. (2015) said that it has advantageous impacts on lipids and biochemical parameters. The plant contains terpenes, alkaloids, flavonoids, cardiac glycosides and steroids.

In spite of the fact that the antibacterial and phytochemical effects of some plants have prior been carried out (Adomi, 2006, Adomi, 2008; Adomi and Umukoro, 2010, Adomi *et al*., 2017; Adomi, 2020; Adomi and Oseh-Jovy, 2020; Adomi, 2021a, Adomi, 2021b Adomi, and Oyubu, 2023), more work to illustrate the phytochemical and antibacterial activities of more plants ought to be investigated. The ever growing diseases that plague mankind give the impetus for more investigations of the antibacterial /medicinal and phytochemical properties in plants in order to discover their usefulness to man.

MATERIALS AND METHODS

Plant collection

Aframomum sceptrum, *Chrysobalanus icaco* and *Piper guineense* seeds were procured from Effurun market in Uvwie Local government area and parts of the spices were taken for identification at Botany Department, Faculty of Science, Delta State University Abraka. Voucher numbers DELSUH 129, DELSUH 130 and DELSUH 132 were assigned respectively to the plants. The active components of seeds were extracted with 70% ethanol, methanol and distilled water. Plant seeds were washed in distilled water and blended with warring blender then extracted with soxhlet extractor apparatus. The extracts were reduced to smaller volume by heating in water bath. The percentage yield of extracts were noted and extracts were preserved at refrigeration temperature

Phytochemical Tests

The phytochemical tests for alkaloids, saponins, tannins, anthraquininones, cardiac glycoside, flavonoids, carotenoids were determined using standard methods as described by Mathew *et al*., (2012).

Antibacterial Susceptibility testing and Minimum Inhibitory Concentration (MIC)

Antibacterial activities and minimum inhibitory concentration of the extracts were carried out according to the methods described previously (Parekh and Chanda, 2007 and Adomi and Nana, 2023a,b). The clinical isolates used in this study were obtained from the Microbiology Department Delta State University, Abraka.

RESULTS

Table 1: Percentage Yield of Crude Extracts.

Plant extract	Colour of extract	Water (%) W/V	Ethanol (%) W/V	Methanol (%) W/V
Aframomum sceptrum	Brown	5.60	4.25	4.6
Chrysobalanus icaco (Omilo),	Brown	8.15	5.25	4.35
Piper guineense	Brown	6.23	4.00	4.15

Table 2: Phytochemical Analysis Result of Spices.

Plants	Qualitative and quantitative phytochemical compounds in spices (mg/100g)									
	1	2	3	4	5	6	7	8	9	10
Aframomum sceptrum	++, 860.91	-	-	+, 316.80	+, 294.14	-	-	-	++, 611.90	-
Chryosobalanus icaco	++,708.07	-	+,17.07	+, 94.00	+ , 64.11	+. 508.00	+, 107.04	-	+, 4.08	-
Piper guineese	++, 860.91	-	+, 188.07	+, 119.09	++, 660.78	-	-	-	+, 72.02	-

Key 1-Alkaloids, 2-Anthraquinine, 3-Saponins, 4-Tannins, 5-Phenols, 6- Cardiac glycoside, 7-Steriods, 8- Terpenoids, 9, Flavonoids, 10- Carotenoids

Table 3: Inhibition Zones of Crude Extracts against Pathogenic Bacteria at 50mg/ml in Milimetres.

Plant extracts	Diameter of inhibition	*S. aureus*	*E. coli*	*P. aeruginosa*	*B. subtilis*	*A. baumannii*	*Enterococcus*	*Streptococcus* sp.
Aframomum Sceptrum								
	Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ethanol	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Methanol	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysobalanus icaco								
	Water	20.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ethanol	0.00	0.00	0.00	0.00	0.00	15.00	18.00
	Methanol	0.00	0.00	0.00	0.00	0.00	17.00	19.00
Piper guineense								
	Water	0.00	0.00	0.00	0.00	10.00	10.00	0.00
	Ethanol	10.00	0.00	0.00	0.00	0.00	0.00	0.00
	Methanol	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 4: MIC in Mg/ml of Crude Extracts from Plant Seeds.

Plant extracts		*S. aureus*	*Streptococcus* sp.	*Enterococcus* sp	*A. baumannii*
Chrysobalanus icaco					
	Water	12.5	-	-	-
	Ethanol	-	-	12.5	12.5
	Methanol	-	-	12.5	12.5
Piper guineense					
	Water	-	25	25	-
	Ethanol	25	-	-	-
	Methanol	12.5	-	-	-

RESULTS AND DISCUSSION

Percentage yield of extracts are presented in the table 1, The lowest percentage yield was obtained for ethanol extract of Piper guineense (4.00%)) and highest was Chrysobalanus icaco water extract (8.15%).

Table 2 shows the phytochemical test results for the plants. The quantity included 860.9mg/100g, 316.8mg/100g, 294.14mg/100g and 611.90mg/100g for alkaloids, tannins, phenols and flavonoids for A sceptum and absence of anthraquinones, saponins, cardiac glycosides, steroids, terpenoids and carotenoids. Piper guineense also showed varying quantities of phytochemical compounds, least to highest included 72.02mg/100g for flavonoids, 119.09mg/100g for tannins, 188.07mg/100g for saponin, 660.78mg/100g for phenols and 860.91mg/100g alkaloids while absence of carotenoids. In Chrysobalanus icaco the phytochemical compounds included 708.07mg/100g for alkaloids, 17.07mg/100g for saponins, 94,00mg/100g for tannins, 64.11mg/100g for phenols, 508.00mg/100g for cardiac glycoside, 107.04mg/100g, for steroids and 4.08mg/100g for flavonoids. Nwankwo (2018) also reported similar report. Afromomum sceptrum showed the presence of phenols, flavonoids and alkaloids. Likewise, Ogunmefun et al. (2017) also reported the presence of the following secondary metabolite in their study. Piper guineense contained carotenoids, tannins, steroids, flavonoids, terpenes, phenols and anthraquinone.

Table 3 show the antibacterial effect of plants at 50mg/ml. Piper guineense water extract was active against Acinetobacter baumannii and Enterococcus sp. Chrysobalanus icaco ethanol extract was active against Enterococcus spp. and Streptococcus spp. with inhibition zone of 15mm and 18mm for ethanol extract and 17mm and 19mm for methanol extract and the highest zone of inhibition was observed for water extract(20mm). Afromomum sceptrum was not potent against any of the microorganisms. The minimum concentration for active spices was 25mg/ml for most extracts from P. guineese (Table 4).The reports from this study collaborates other findings concerning these plants. Methanolic extract of Chrysobalanus icaco was active against S. aureus and S. pyogenes (Castilho and Kaplan, 2011) Similarly, Candida species were sensitive to hydroalcoholic extract of Chrysobalanus icaco (Silva et al, 2017) .Other report presented that ethanol extract of Piper guineese was more potent than aqueous extract against S. aureus, Escherichia coli, Salmonella spp and fungi (Ogbuagu, 2021) which agreed with this study. In addition, aqueous extract of P. guineense showed highest activity than ethanol and n -hexane in another study (Ogunmefun et al., 2017).The phytochemical and antibacterial properties as shown in this study demonstrates the basis of their use in ethnomedicine for treatment of diseases Further research on pharmacology of the active plant seeds should be done to show the possibilities of being used for formulation of medicines for the treatment of bacterial infections and diseases.

CONCLUSION

The methanol, ethanol and water of plant seeds extracts investigated in this study included Afromomum sceptrum, Piper guineense, and Chrysobalanus icaco. Except for Afromomum sceptrum, the plant extracts were active against Enterococcus sp., Streptococcus sp. and Acinetobacter baumannii The mimimum inhibitory concentration of extracts of Chryosobalanus icaco ethanol, methanol and water extract was 12.5mg/ml for Acinetobacter baumannii, Enterococcus sp and Staphylococcus aureus. While for Piper guineensis , the MIC of water and ethanol extracts for Streptococcus spp, Staphylococcus aureus, and Enterococcus sp was 25mg/ml. Phytochemical compounds present in Piper guineense included flavonoids, tannins, saponins, phenols, and alkaloids while C. icaco phytochemical compounds were alkaloids, saponins, tannins, phenols, cardiac glycoside, steroids and flavonoids. Further studies on the fraction of plants seeds should be investigated to show the possibility of being used in formulation of medicines for treatment of bacterial diseases.

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