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Original Research

Comparative Studies on Chemical Compositions and Bioactivity of Fresh Fruit and Seed of *Aratocarpus heterophyllus*

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ABSTRACT: Due to the high expense of synthetic medications, pharmaceutical corporations have prioritized research into new chemicals of plant origin for the treatment of ailments. Products made from organic sources are inexpensive and valuable as precursors in the manufacture of medications. Numerous fruits and seeds are recognized to have long-term environmental impacts and to be physiologically active in people. The chemical makeup and biological activity of fruit and seed extracts from Aratocarpus heterophyllus were compared in this study. The research looks at the fruit and seed of the hexanolic extracts of the study sample under inquiry, as well as the proximate analysis, phytochemical screening, mineral content, and bioactivity tests. With the exception of catechin (38.326), ribalinidine (10.593), and epihedrine (42.943), which were present in the fruit but absent from the seed, and cyanogenic glycoside (27.536), lunamarin (0.280), and flavan-3-ol (4.120), which were present in the seed but absent from the fruit, the study demonstrates that the fruit and seed are both rich in nutrients and contain the same phytochemicals. The fruit and seed both contained phytate (33.753 in the fruit and 29.860 in the seed), as well as the secondary metabolite oxalate (37.260 in the fruit and 36.876 in the seed). The results also showed that Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella enterica, Citobactermurliniae, Bacillus licheriformis, Micrococcus roseus, and Bacillus subtilis were sensitive to both the fruit and seed extracts, but ampiclox, the control drug, was less active on the chosen clinical pathogens. For both the fruit and the seed samples, it was discovered that the sample under examination had a high percentage of carbohydrates (52.8 and 51.009, respectively). The fruit has a high mineral concentration, according to the study. According to the study's findings, fruit and seeds contain active metabolites that have significant therapeutic benefits and are crucial to the pharmaceutical sectors.

Keywords: *Aratocarpus heterophyllus* fruit, seed, chemical makeup

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INTRODUCTION

Since the dawn of civilization, medicinal plants have served as a source of healing for practically all communities. Certain chemical substances that perform certain physiological functions in the human body make up the vital worth of plants. The most significant components are the bioactive ones, which include alkaloids, tannins, flavonoids, and phenolic chemicals. However, some of these plants are native medicinal herbs that are used as spices or food for people or animals. The great majority of these plants are weeds that are useless to humans. Pharmaceutical companies value the antimicrobial properties of plant extracts and phytochemicals (Bhat et al., 2017; Nna et al., 2017; Okacha et al., 2023). Key molecules called phytochemicals are those that are present in medicinal plants and which, while not necessary for the normal operation of the human body, are active and have positive effects on the treatment of disease. There are several phytochemicals that are now understood, but many more need to be found (Nomura et al., 2019).

Aratocarpus heterophyllous, sometimes known as the jackfruit, is a tropical tree that bears complicated or many fruits (syncarps), each of which has a thick, rubbery, white to yellowish wall and an exterior rind that ranges in color from green to golden brown and is made up of hexagonal, bluntly conical carpel apices. Each seed is encased in the acidic, somewhat sweet (when ripe), and banana-flavored flesh. The dense fruit's fibrous core in the center keeps it together. Fruits are rectangular and cylindrical in form and range in length from 30 to 40 cm. The seeds have a thin, white membrane enclosing them and are spherical, light brown, and 2-3 cm length by 1-1.5 cm wide. In each fruit, there may be up to 500 seeds. In cold, humid settings, seeds may be kept for up to a month since they are resilient (Hemborn, 1996; Chandrika et al., 2004).

The leaves may be used to treat skin conditions such as boils, wounds, and fevers. Astringent, bitter, and carminative qualities are present in young fruits. The ripe fruits are scrumptious, aphrodisiac, cooling, laxative, and brain tonic. The seeds have a diuretic and a laxative effect. According to Avinash and Rai (2017), the wood has nervine, anti-diabetic, sedative, and anticonvulsant properties. According to Gaire and Subedi (2014), latex is an antibacterial agent that may be used to treat pharyngitis, ocular problems, and dysopia. Ulcers may be treated using ash from jackfruit leaves. Dry latex contains artostenone, which may be converted to artosterone and is an androgenic substance. When coupled with vinegar, latex accelerates the healing of glandular edema, snakebite, and abscesses (Jomova and Valko, 2011; Vaidya and Gogte, 2000). Asthma and skin issues are addressed from the source. Fever and diarrhea are treated with an extract of the root. For making poultices, the bark is employed. Warm leaves are used to cure wounds. The wood is sedative, the pith is abortifacient, and the latex is anti-inflammatory, according to Gupta and Tandon (2004).

For a multitude of reasons, including their accessibility without a prescription, affordability, natural origin, and potential to reduce the need for synthetics, plant research for medicinal purposes has grown in popularity lately (Petkova, 2019). In most regions of the globe, bacterial illnesses and antibiotic resistance are on the rise. If required antibiotics are not taken, modern medical treatments including organ transplants, chemotherapy, and surgery might become hazardous. Due to the spread of contemporary illness, poverty, and the failure of conventional treatment in Western Africa, people's faith in traditional medicine has strengthened. According to Okocha et al. (2023), natural treatments are generally accessible, affordable, and accessible. Many families see it as a sort of therapy as a consequence. Many individuals have become anemic from malnutrition brought on by poverty, making them susceptible to a wide range of illnesses. The majority of Nigerians' inability to use and lack of access to contemporary drugs has led to the adaptation of plant treatment (Correa et al., 2012; Anarado et al., 2021).

Due to the presence of flavonoids, tannins, carbohydrates, saponins, alkaloids, tannins, triterpenoids, and proteins in plant extracts, phytochemical analysis studies play a crucial role in the discovery of bioactive principles (Sundarraj and Ranganathan, 2017). Depending on the cultivar and environment, Aratocarpus heterophyllous' phytochemical components may change (Azad, 2000; Wetprasit et al., 2000). According to Wetprasit et al. (2000), the fruit contains significant amounts of flavonoids, stillbenoids, morin, artocarpin, dihydromorin, cynomacurin, isoartocarpin, cyloartocarpin, artocarpetin, artocarpanone, oxydihydroartocarpesin, norartocarpetin, and cycloartinone. As a result, it has powerful anti-inflammatory, antibacterial, antifungal, anticarcinogenic, antineoplastic, cicatrizant, and antioxidant properties.

Therefore, researchers have intensified their focus on quantifying and identifying active metabolites in various plant extracts in order to support the medicinal benefits and economic potential of the fruit and seed of Aratocarpus heterophyllus. The objective of this research is to examine the chemical makeup of fresh Aratocarpus heterophyllous fruit and seed, as well as to look into the bioactivity of the plant's fruit and seed extracts and the potential for human health benefits.

MATERIALS AND METHODS

Chemicals and Reagents

Glacial acetic acid, acetic anhydride, sulphuric acid, ethyl acetate, ferric chloride, phenols, and HCl were among the substances employed in the study.

Plant material collection

The Aratocarpus heterophyllus fruit and seeds utilized in this research came from Khana Local Government Area, Rivers State, Nigeria's Kaa market. Before further extraction and analysis, the seeds from the fruit were removed, dried in the sun for twenty (20) days, powdered into a fine powder, and kept in an airtight container.

Preparation of plant extract

A glass container was filled with 250 ml of ethyl acetate and 10g of the powdered material. Then, after 5 minutes, the bottle was taken out of the low-temperature microwave oven and let to cool. Filtered from the mixture, the leftover material was placed in a glass jar to dry. The extracts were dried by evaporation at a temperature of 33ºC (Nna et al., 2017).

Phyto-chemical profiling test

Test for steroids and triterpenoids (Liebermann-Burchard test)

Three drops of acetic anhydride were added to the extract, which was then heated and cooled. When concentrated sulfuric acid was added from the test tube's sides, a brown ring was seen to develop at the junction of two layers. According to Sabri et al. (2012), the creation of a deep red hue in the bottom layer and the coloring of the top layer becoming green would both signify a good test for triterpenoids and steroids.

Test for cardiac glycosides (Keller-Killiani Test)

A diluted ferric chloride solution was combined with 3 drops of concentrated glacial acetic acid and around 3 mg of the extract. Concentrated sulfuric acid was applied, and the development of two layers was watched. A good result for glycosides would be seen in the top acetic acid layer, which becomes blue green, and the upper reddish brown layer.

Fehling's solution test for reducing sugars

The method used to analyze decreasing sugar was consistent with Satheesh et al. In a dry test tube, 1 mg of an extract was added along with 5 cm3 of ethyl acetate, and the tube was shaken for 5 minutes. There was filtering of the extract. The Fehling's solutions A and B (1:1) were combined with 2 cm3 of the ethyl acetate extract in a test container, where they were heated for 5 minutes. A brick-red precipitate would be a sign of the presence of reducing sugar.

Test for phenolics and tannins (ferric chloride test)

In 2 mL of the extraction solvent, 2 mg of each crude extract was dissolved, and 4 drops of ferric chloride solution were added. The development of a bluish-black hue is a sign that phenols are present. In general, gallic tannins would be indicated by the creation of a bluish-black color, while cathechic tannins would be indicated by the formation of a bluish-green color (Nna et al., 2017).

Test for flavonoids (alkaline test)

The extract (5 mg) was added to a sodium hydroxide solution diluted in 5 mL. The presence of flavonoids is indicated by the emergence of a yellow color that would become colorless when a few drops of diluted hydrochloric acid were added.

Test for saponins

As a screening test, saponins' capacity to produce foam in aqueous solutions was used (Prakash et al., 2009). The extract (5 mg) and distilled water (5 mL) were combined in a test tube and forcefully shaken. The formation of a significant amount of froth that would last for around 30 minutes revealed the presence of saponins.

Test for alkaloids.

A test tube containing 3 mL of an extract and 1 mL of 10% HCl was heated for 20 minutes. A little amount of Mayer's reagent was added to 1 mL of the filtrate after it had cooled and been allowed to cool. Alkaloids would be present if there were any creamy precipitates.

Test for protein

mixture of crude extract (1 ml) and Millon's reagent (2 ml) produced a white precipitate that, when heated gently, became red, indicating the presence of protein.

Proximate composition

Moisture content (MC)

2 g of the sample were placed in the crucible and dried overnight at 1050°C in the oven. The dried samples were weighed to a consistent weight after cooling in a dessicator for 30 minutes. According to Nsude and Orie (2002), the percentage weight loss was reported as a percentage moisture content.

$$\text{Moisture Content MC}(\%) = \frac{W_2\text{-}W_3}{W_2\text{-}W_1} \text{ X } 100$$

W1 stands for the weight of the container with the lid, W2 for the weight of the container with the lid and the sample before to drying, and W3 for the weight of the container with the lid and the sample after drying.

Ash content

The ground sample (2.0 g) was put in a crucible and ashy at 600ºC for 3 hours in a muffle furnace. The heated crucibles were weighted and desiccated to cool them. Ash content was used to describe the residual weight % (AOAC, 1999).

$$\text{Ash Content (\%)} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

W_1 = Weight of container, W_2 = Weight of Container + Sample before ashing, $W_2 - W_1$ = Weight of Sample before drying, W_3 = Weight of container + Sample after ashing, W_2- W_3 = Weight of Ash in sample

Fibre content

Using 20% H2SO4 and NaOH solutions, the sample (2.0g) was utilized to estimate crude fiber using acid and alkaline digestion procedures (Prakash et al., 2009).

Protein content

Using an LECO model elemental analyzer (LECO FP628, USA), total nitrogen was measured to estimate the protein content (PC), which was then calculated by multiplying total nitrogen by 6.25. The PC value was given as a percentage of dry matter (% DM).

Carbohydrate

The following formula was used to determine the amount of carbohydrates: Available carbohydrate (%), = 100 - [protein (%), moisture (%), ash (%), fiber (%), and fat (%)].

Mineral analysis

Two grams of finely crushed samples were put in a crucible and heated to 550ºC for six hours in a muffle furnace. Before being filtered into sample vials, the ash was mixed in 10 ml of 10% HNO_3 and gently heated for around 20 minutes. Using the method recommended by the Association of Official Analytical Chemists (AOAC) 1990, the filtrate's mineral content was ascertained. The mineral content of the extracts was assessed using a flame photometer and an atomic absorption spectrophotometer (AAS).

Antimicrobial screening

Pathogenic microorganisms were used to test the antibacterial activity of the plant extracts. The University of Port Harcourt's Department of Microbiology is where the bacteria were collected. A concentration of 10 mg/mL was achieved by weighing the extract (0.1 g) and dissolving it in 10 mL of DMSO. For the purpose of determining the antibacterial activity, this concentration was used as the starting point.

The extracts were screened using the agar diffusion technique. The medium used to culture the microorganisms was Mueller Hinton Agar (MHA). In sterile Petri plates, the medium were produced in accordance with the manufacturer's instructions, sterilized at 121°C for 15 minutes, and then allowed to cool and harden. The standard inoculum of test microorganisms (0.1 mL) was then planted onto the sterilized medium. Using sterile swabs, the inocula were equally distributed across the media surfaces. Each inoculation medium had a well cut out of the center using a normal cork borer (6 mm). The extract was then diluted to a concentration of 10 mg/mL in 0.1 mL and added to each well of the medium. After the infected media had been incubated for 24 hours at 37ºC for bacteria and for 30ºC for yeast, each plate was examined for growth inhibition zones. A clear ruler was used to measure the zone of inhibition, and the result was recorded in millimeters.

Quantitative phytochemical screening by GC-FID

The phytochemicals in the extract were measured using BUCK M910 Gas Chromatography (BUCK Scientific, USA). A RESTEK 15-m MKT1 column (15m x 20m x 0.15um) and a flame ionization detector were used with the gas chromatography. A 20cm splitless injection of the sample was made at a temperature and velocity of 280ºC and 30cm/s, respectively. The carrier gas utilized was helium (5.0pa), flowing at a rate of 40 ml/min. 200ºC will be the first oven temperature. The detector was run at 320ºC while the oven was heated at a rate of 3ºC/min until a temperature of 330ºC was reached. Phytochemicals were identified by comparing the area and mass of the internal standard to the area of the newly found phytochemicals.

RESULTS AND DISCUSSION

Qualitative phytochemical screening of *aratocarpus heterophyllus* fresh fruit and seed

Table 1 displays the results of a qualitative phytochemical analysis of Aratocarpus heterophyllus fresh fruit and seed extracts. Alkaloids, saponins, tannins, triterpenoids, and flavonoids were found in the crude fruit and seed extracts after a phytochemical screening was done to determine their quality. Heart glycoside was absent from the seed but was present in the fresh fruit (Petkova, 2019). Fresh fruit and seeds of Artocarpus heterophyllus lacked the steroid. According to the research, Artocarpus heterophyllus fruit and seed extracts include a range of phytochemicals, and their existence confirms their medicinal value to the pharmaceutical business. This is in line with Hazra (2019), who looked into the phytochemical

Table 1: Qualitative phytochemical screening.

Phytochemicals	Inference Fruit	Inference Seed
Alkaloid	+	+
Tannins	+	+
Saponins	+	+
Flavonoids	+	+
Cardiac glycoside	+	-
Steroid	+	+
Triterpenoids	+	+

Table 2: Quantitative phytochemical screening of the fresh.

Compounds	Fresh fruit (µg/ml)	seed (µg/ml)	Class
Resveratrol	39.586	0.080	Flavonoid
Proanthocyanin	0.116	44.170	Flavonoid
Naringin	2.223	17.966	Flavonoid
Anthocyanin	6.893	7.470	Flavonoid
Naringenin	13.300	2.390	Flavonoid
Rutin	19.516	6.016	Flavonoid
Flavonones	22.293	20.313	Flavonoid
Kaempferol	28.566	25.650	Flavonoid
Epicatechin	29.493	34.600	Flavonoid
Flavone	34.206	32.996	Flavonoid
Catechin	38.326	-	Flavonoid
Cardiac glycoside	3.950	42.276	Glycoside
Cyanogenic glycoside	-	27.536	Glycoside
Ribalinidine	10.593	-	Alkaloid
Lunamarin	-	0.280	Alkaloid
Spartein	15.783	12.970	Alkaloid
Epihedrine	42.943	-	Alkaloid
Steroids	26.000	22.730	Triterpenoid
Flavan-3-ol	-	4.120	Tannins
Tannin	40.930	10.366	Tannins
Oxalate	37.260	36.876	-
Phytate	33.753	29.860	-
Sapogenin	42.086	39.200	Saponin

research of Terminalia bellirica fruit inside, and Baliga et al. (2011), who studied the phytochemistry, nutritional, and pharmacological aspects of Artocarpus heterophyllus (jackfruit).

Quantitaive phytochemical screening of fresh fruit and seed extracts of *Aratocarpus heterophyllus*

The results of a quantitative phytochemical analysis of *Aratocarpus heterophyllus* fresh fruit and seed extracts were displayed in (Table 2). The quantitative analysis showed that 20 phytochemicals were present in both the fruit and the seed, with the distribution being as follows: the fruit and seed have 11 and 10 flavonoids, 1 and 2 glycosides, both the fruit and seed have 2 alkaloids, 1 sapnin, and the triterpenoid, saponin, oxalate, and phytate were all present and found to be present in one each. The majority of the metabolites discovered in the fruit and seed were flavonoids; the greatest concentration of resveratrol in the fruit was 39.586 g/g, while the highest concentration of proanthocyanin was 44.170 g/g. According to the research, as compared to the seed extract, fresh fruit has greater concentrations of resveratrol (39.586 g/g), naringenin (13.300 g/g), flavonones (22.293 g/g), flavone (34.206 g/g), and catechin (38.326). The result showed that the proanthocyanin (44.170 g/g), naringin (17.966 g/g), anthocyanin (7.470 g/g), and epicatechin (34.600 g/g) content of the seed is higher than that of the fruit extract. The results of Bhandary et al. (2012), who worked on the preliminary phytochemical screening of various extracts of Punica granatum peel, whole fruit, and seeds, and Nna et al. (2018), who reported on determination of phytoconstituents and antimicrobial analysis of the ethyl acetate extract of Carica papaya seed, were both supportive of the findings. The study also showed that cardiac glycoside (42.276 g/g) and cyanogenic glycoside (27.536 g/g) were both identified in greater concentrations in the seed extract than the fruit extract. Since it has been established by Kren and Martnková

Table3: Proximate Composition Fresh Fruit and Seed *Aratocarpus heterophyllus.*

Proximities	Composition (%) of Fruit	Composition (%) of seed
Moisture content	17.5	8.631
Ash content	4.8	4.620
Fibre content	6.9	9.503
Fat content	7.3	11.188
Protein	11.2	15.05
Carbohydrate	52.8	51.009

(2001) that cardiac glycosides are used in medicine to treat heart failure, some irregular heartbeats, and conditions related to the heart, the high content of cardiac glycoside implied that the seed of Aratocarpus heterophyllus could be used in pharmaceutical industries. By producing poisonous hydrogen cyanide following tissue injury, the high concentration of cyanogenic glycosides in the seed extract suggests that they may operate as herbivore defenses (Yulvianti and Zidorn, 2021). It could be the cause of the fruit's lack of the Aratocarpus heterophyllus seed, which has not been eaten.

The result in Table 2 also lists the several alkaloids and the amounts of each in fruit and seed. In contrast to the seed extract, which possesses Spartein (12.970 g/g), the fresh fruit has Ribalinidine (10.593 g/g), Spartein (15.783 g/g), and Epihedrine (43.943 g/g), whereas the fresh fruit lacks Lunamarin (0.280 g/g), which is present in the seed extract. Ilochi et al. (2021) investigation of the pharmacognostic, nutraceutical, and phytotherapeutic contents of unripe Musa sapientum hydromethanolic extracts and Achikanu et al. (2022) study of the proximate and phytochemical composition of Phyllanthus amarus provide evidence for this. Due to the fact that epihedrine is utilized in the management and treatment of clinically severe hypotension (Südfeld et al., 2017; Nsude and Orie, 2023), the high concentration of epihedrine in fresh fruit raises the possibility that it may have medical applications.

In this investigation, tannins were also discovered in the seeds of Aratocarpus heterophyllus and fresh fruit. While the flavan-3-ol was present in the seed (4.120 g/g) but lacking in the fruit, the tannin was present in both the fresh fruit (40.930 g/g) and seed (10.366 g/g). This is consistent with Pizzi's (2021) research on the use of tannins in pharmaceutical, medical, and related fields. Tannins can be used as anticancer, virucides, antioxidants, antimicrobial and anti-inflammatory agents, anti-diabetic, wound healing, cardiovascular protection, antidiarrheal agents, etc. because they are present in both fruit and seed in high concentrations in fruit (Nna et al., 2017; Fraga-Corral et al., 2021).

Steroids (triterpenoid), oxalate, phytate, and sapogenin (saponin) were other phytochemicals identified in this investigation (Table 2). Since sapogenin has been utilized as an antibiotic and protective chemical for plants, its presence in both fresh fruit and seed suggests that Aratocarpus heterophyllus may act as an anti-microbial (Okocha et al., 2023).

Phytate was a significant secondary secondary metabolite present in both the fruit and seed of Aratocarpus heterophyllus. The fruit and seed were estimated to contain 33.753 g/g and 29.860 g/g of phytate, respectively. Phytate is a substance that the body uses as a nutrition and has been shown to have antilipidemic and anti-inflammatory properties (Ejiofor andNna, 2022).

Proximate Composition of Fresh Fruit and Seed *Aratocarpus heterophyllus*

Table 3 shows the approximate composition of the fresh fruit and seed of Aratocarpus heterophyllus. The moisture, ash, fiber, fat, protein, and carbohydrate contents are listed in the table. The outcome showed that, with some modifications, the same proximate elements discovered in the fruit were also present in the seed of Aratocarpus heterophyllus. According to the findings, fresh fruit has a higher moisture and carbohydrate content than seed, whereas seed has a higher fat and protein level than fresh fruit. Given that both fruits and seeds contain carbohydrates, it follows that both have a similar ability to provide energy and may support the development and expansion of organisms. The high fat content of the seed suggests that, among those who eat more dietary fiber, the seed may lower their risk of coronary heart disease, stroke, hypertension, diabetes, obesity, and a variety of gastrointestinal diseases. When absorbed by organisms during breathing, sweating, and digesting, the fruit's high moisture content suggests that it might be utilized to control and maintain cells, tissues, and essential organs (Prakash et al., 2009).

Mineral concentrations of fresh Fruit and Seed Extracts of *Aratocarpus heterophyllus*

Table 4 displays the mineral content of Aratocarpus

Table 4: Mineral concentrations of *Artocarpus heterophyllus* fruit and seed.

Minerals	Fuit (PPM)	Seed (PPM)
Copper	0.222	0.278
Iron	0.634	0.732
Magnesium	5.493	6.893
Zinc	0.183	0.293
Calcium	4.065	4.783
Potassium	5.289	6.893
Sodium	5.378	4.389

Table 5: Antimicrobial activity and zone of inhibition fruit and seed.

Test organisms	Fruit Extract				Seed Extract				Control (Ampiclox)			
	K	Y	Z	X	K	Y	Z	X	X	Y	Z	X
Pseudomonas aeruginosa	19	22	20	20.33	22	24	21	22.33	50	48	46	48.0
Staphylococcus aureus	22	26	21	23.0	27	24	22	24.33	52	56	53	53.7
Salmonella enterica	25	22	24	23.7	22	26	25	24.33	43	44	46	44.3
Citobactermurliniae	21	22	24	22.3	24	22	25	23.67	40	35	37	37.3
Bacillus licheriformis	22	24	22	22.7	21	20	23	21.33	40	44	40	41.3
Micrococcus roseus	20	22	24	22.0	17	19	20	18.67	40	39	37	38.7
Bacillus subtilis	23	22	20	21.7	22	20	22	21.33	41	39	45	41.7

K,Y and Z = triplicate measure; X= average

heterophyllus fruit and seed extracts. It displayed the amounts of sodium, potassium, calcium, magnesium, iron, and copper. The fruit and seed of Aratocarpus heterophyllus contained seven different minerals, with varying concentrations. With the exception of sodium, which was marginally higher in the fresh fruit, the mineral concentrations in the seed were somewhat greater than those in the fruit.

Magnesium had the greatest mineral concentration, coming in at 5.493 for fruit and 6.893 for seeds. Magnesium is necessary for the body because it controls blood pressure, blood sugar levels, muscle and neuron function, and the production of DNA, protein, and bone (Batta, 2017).

Other minerals required for body and function include copper, which is a cofactor for several significant enzymes, such as cytochrome c oxidase (in the mitochondrial electron transport chain), superoxide dismutase (part of the protection against reactive oxygen species), and lysyl oxidase, which is required for the cross-linking of collagen and elastin (Mercer and Llanos, 2011). Iron, which is found in red blood cells and is One of the most widespread and often utilized inorganic elements, sodium is essential to many bodily processes. Additionally, it enhances mental performance, relieves muscular cramps, and delays the onset of premature aging symptoms. Accordingly, if stated in regimental order, the fruit and seed of Aratocarpus heterophyllus might provide the body with this function due to the existence of the mineral elements.

Antimicrobial activity of fresh fruit and seed extracts *Aratocarpus heterophyllus*

Table 5 displays the results of the antimicrobial examination of fresh Aratocarpus heterophyllus fruit and seed. Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella enterica, Citobactermurliniae, Bacillus licheriformis, Micrococcus roseus, and Bacillus subtilis were a few pathogens that were taken into account and were common in the clinic (Odoki et al., 2019). Antimicrobial profiling was carried out in triplicate (K, Y, Z) for the fruit and seed extracts as well as for the amplicox utilized as a control, and the average was represented with X. All clinical pathogens were sensitive to and competitive with the fruit and seed extracts. Compared to the seed extract, the fresh fruit extract was more sensitive to Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella enteric, and Citobactermurliniae, with average zone inhibitions of 22.33mm, 24.33mm, 24.33mm, and 23.67mm, respectively (Odoki et al., 2019; Sreeja et al., 2021). According to the antimicrobial profile results, all of the identified pathogens were more susceptible to ampicillin than to fruit and seed extracts. This is due to the fact that Aratocarpus heterophyllus fruit and seed extracts have a greater zone of inhibition for the common antibacterial agent. This finding is in line with research by Ragasa et al. (2004) on the antimicrobial properties of Artocarpus heterophyllus and Tramontin et al. (2019) on the biological activity and chemical composition of Brazilian jackfruit seed extracts made using supercritical CO_2 and low pressure methods.

Conclusion

The current research primarily compared the chemical make-up and biological activity of fresh fruit and seed from Aratocarpus heterophyllus. Alkaloids, saponins, tannins, triterpenoids, and flavonoids were discovered in the crude extracts of fruit and seed after a phytochemical screening. Additionally, cardiac glycoside was present in the fresh fruit, although it was absent in the seed. The fruit and seed of Aratocarpus heterophyllus contain 20 phytochemicals, with minor variations in concentration, and a total of seven minerals. All clinical infections could not withstand the sensitivity and effectiveness of the fruit and seed extracts. While the seed extract was only marginally susceptible to Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella enterica, and Citobactermurliniae, the fresh fruit extract was more sensitive to Bacillus licheriformis, Micrococcus roseus, and Bacillus subtilis. Based on their sensitivity to clinical infections, the results of this study showed that the fruit and seed of Aratocarpus heterophyllus both contained comparable phytochemicals and minerals in very consistent amounts. They might also be employed as feedstuff and as an antibacterial agent. Therefore, they are advised for human consumption in order to lead a healthy lifestyle and may act as supplements to boost the immune system and provide the body with nutrients.

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