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RESEARCH ARTICLE

Phytochemical Constituents and Medicinal Properties of Different Extracts of *Anacardium Occidentale* and *Psidium Guajava*

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ABSTRACT

Background: Folklore involves the use of parts of plants without isolating particular phytochemicals. The argument is that the synergy of the combined substances enhances the efficacy and dilutes toxicity. Modern pharmacy, however, prefers single ingredients on the grounds that dosage can be more easily quantified. One of such efforts includes detailed analysis of phytochemical constituents of such plants. Although much study has been carried out on phytochemical screening, the results may differ as a result of the biochemical variations within species, geographical locations, methods or modes of extraction and solvent used.

Objectives: This work, therefore, aimed at carrying out a preliminary study of the phytochemistry of the extracts *Anacardium occidentale* (cashew) and *Psidium guajava* (guava) as a scientific rationale behind the medicinal uses of the plants.

Methods: Aqueous and methanol extracts of leaf, bark and root cashew and guava were assayed quantitatively for tannin, total polyphenol, oxalate, saponin and alkaloid

Results: Highest concentrations of the bioactive principles were detected in ethanolic extracts of the plants except in the case of saponin where the hot water extract produced the highest bioactive principle. In Guava was foung tannin-11.5mg/g, total polyphenol-1.67mg/g, alkaloid-59.85% and oxalate-6.66. In Cashew tannin-15.38mg/g, total polyphenolics-2.00, alkaloid-39.90 and oxalate-8.13 was detected

Conclusion: The detected bioactive principle, in this study, may be responsible for the documented and folklore beneficial effects. Results from this study also justified the use of alcohol in folklore extraction.

Keywords: Guava, Cashew, Phytochemistry, bioactive, medicinal, extraction

1. INTRODUCTION

Plants of various origins have been exploited effectively over many generations for therapeutic purposes. The selection procedure was often haphazard to the extent that some valuable errors are caused [1]. Thus, the discard or otherwise of such plant depends on its being beneficial or hazardous.

In the local traditional settings, plant parts such as the roots or leaves are used without recourse to phytochemical isolates [2]. The argument is that the synergy of the combined substances enhances the efficacy and dilutes toxicity [3]. Modern pharmacy, however, prefers single ingredients on the grounds that dosage can be more easily quantified [1].

Studies have been carried out to ascertain the claimed medicinal or therapeutic effects of plants. The current efforts towards standardization of herbal products are aimed at enhancing their uses. One of such efforts includes detailed analysis of the phytochemical constituents of such plants. These are physiologically active principles [4]. It is these secondary metabolites and pigments that can have therapeutic actions in humans and which can be refined to produce drugs.

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Basic phytochemical screening consists of performing simple chemical tests to detect the presence of alkaloids, saponins, anthraquinones etc in a plant extract [5, 6, 1]. It has also been shown that the chemical profile of a single plant may vary over time as it reacts to changing conditions [7].

This work, therefore, aimed at analysing the chemical components of *Anacardium occidentale* and *Psidium guajava* as a probable scientific justification for their medicinal uses by traditionalists.

COMPONENT/ SAMPLE	Guava root	Guava bark	Guava leaves
TANNIN(mg/g)			
CWE	3.08±0.10	3.85±0.33	5.90±0.34
HWE	3.69±0.22	3.59±0.32	5.77±0.43
EOE	2.00±0.20	3.85±0.14	11.54±0.14
TOTAL POLYPHENOL(mg/g)			
CWE	0.20±0.10	0.30±0.10	0.40±0.10
HWE	0.30±0.10	0.22±0.11	0.42±0.15
EOE	0.10±0.10	0.45±0.20	1.67±0.24
ALKALOID (%)			
CWE	8.98±0.33	6.98±0.23	10.31±0.23
HWE	11.31±0.34	4.66±0.22	9.98±0.13
EOE	4.32±0.20	6.65±0.15	59.85±0.34
SAPONIN (%)			
CWE	3.36±0.21	4.20±0.13	1.05±0.15
HWE	4.03±0.20	4.37±0.16	1.03±0.13
EOE	2.27±0.11	1.03±0.15	1.86±0.15
OXALATE (%)			
CWE	2.00±0.23	2.66±0.11	3.74±0.12
HWE	2.40±0.03	2.50±0.10	3.13±-0.03
EOE	1.35±0.11	3.66±0.10	6.66±0.14

Table 1: Composition of Tannin, Total polyphenol, Alkaloid, Saponin and Oxalate in aqueous and ethanolic extracts of *Psidium guajava* (Guava)

Guava is a plant in the myrtle family (Myrtaceae) genus *Psidium*. It is a common shade tree or shrub in door-yard gardens in the tropics. Guava fruits are eaten fresh and made into drinks, ice cream, and preserves. Extracts from guava leaves or bark are implicated in therapeutic mechanisms against cancer, bacterial infections, inflammation and pain [8, 9, 10]. Essential oils from guava leaves display anti-cancer activity in vitro [11]. Guava leaves are used in folk medicine as a remedy for diarrhea andfever; the bark as antimicrobial and as an astringent [12]. Guava leaves or bark are used in traditional medicine as anti-diabetic [13].

The cashew is a tree in the family Anacardiaceae. The leaves are used traditionally for toothaches and gum problems; and, in West Africa, to treat malaria. The bark is used to detoxify snake bite, as well as for fevers, a laxative, to rid intestinal parasites, and to treat diabetes. Studies showed that, although, the tannins in the bark had anti-inflammatory action when used internally to treat rheumatism, it could also be toxic to humans [14]

2. MATERIALS AND METHODS:

Collection and processing of plant materials:

The fresh leaf, bark and root of the plants used in this study were sourced locally from South Western part of Nigeria. Specimens were deposited in the herbarium section of the University of Ado – Ekiti, Nigeria.

Fifty gram (50 g) of fresh leaf, bark and root of *Anarcardium occidentale* and *Psidium guajava* were separately chopped into pieces and subsequently blended. Aqueous extracts of the milled parts were obtained under two conditions. First, by soaking in 200ml of ordinary distilled water for 24 hours at room temperature and second, by soaking in 200ml of previously boiled distilled water for 24 hours.

Alcoholic extracts of another set of plant parts were also obtained by soaking 50g of chopped and milled parts separately in 200ml of 95% (v/v) alcohol for 24 hours. All the extracts were thereafter filtered using Whatman filter paper No. 1. Each filtrate was concentrated using rotary evaporator at 40°C and the concentrated extract was stored in a universal bottle and refrigerated until used.

Quantitative determination of the phytochemical constituents

Chemical tests were carried out on the extracts using standard procedures as described [1, 5, 6, 7].

3. RESULTS

Ethanolic extracts of *Anacardium occidentale* (cashew) and *Psidium guajava* (guava) produced the highest percentage of the phytochemical constituents except in the case of saponin where the hot water extract produced the greatest yield (Tables 1 and 2).

The highest concentrations of tannin and alkaloid were found in the ethanolic leaf extracts of cashew (15.38mg/g), guava (11.54mg/g) and cashew (39.90%), guava (59.85%) respectively (Tables 1 and 2).

Total polyphenolic concentration was also highest in the leaves of the plants under study; guava (1.67mg/g) and cashew (2.00mg/g).

Saponin concentration was highest in guava bark hot water extract (4.37%) and cashew bark hot water extract. (7.46%).

Oxalate concentration followed the trend of alkaloid, phenol and tannin with ethanolic extracts of the leaves (8.13%) cashew and (6.66%) guava.

4. DISCUSSION:

The observed trend of highest phytochemical constituents from ethanolic extract in the present study probably accounts for the use, often times, of alcoholic drinks in producing herbal extracts from local herbs in South West of Nigeria. The Probable reason is the amphipathic property of alcohol that ensures dissolution of both polar and non-polar constituents of plants. Though alcohols may seem to be a good solvent for extraction results from this study showed that some chemicals like saponin may not be fully extracted. To this end, maximum medicinal effect may not be obtainable in instances where saponin is the component responsible for the desired effect.

That the highest concentrations of tannin, polyphenol and alkaloid were found in the ethanolic leaf extracts of the plants under study probably gives credence to the use of the leaves of the plants under study for malaria fever as reported by Irigoyen [15]. These two components have been shown to posess antiviral, antibacterial, antifungal and antihelminthic properties. A plausible case can therefore be made for the effect of these plant parts against worms, *Clostridium spp*, *Pseudomonas spp* and treatment of infantile rotaviral enteritis [16, 17].

COMPONENT/ SAMPLE	Cashew root	Cashew bark	Cashew leaves
TANNIN(mg/g)			
CWE	2.62±0.23	4.77±0.13	4.04±0.10
HWE	4.92±0.14	5.38±0.14	3.27±0.33
EOE	4.15±0.16	5.38±0.33	15.38±0.12
TOTAL POLYPHENOL(mg /g)	-	-	-
CWE	0.19±0.10	0.26±0.17	0.38±0.14
HWE	0.42±0.22	0.29±0.11	0.30±0.33
EOE	0.16±0.20	0.25±0.11	2.00±0.11
ALKALOID (%)			
CWE	7.32±0.16	11.97±0.23	5.32±0.12
HWE	16.29±0.12	14.63±0.13	14.63±0.14
EOE	8.31±0.20	15.96±0.21	39.90±0.11
SAPONIN (%)			
CWE	2.77±0.13	6.99±0.12	1.16±0.12
HWE	5.04±0.21	7.46±0.23	2.40±0.33
EOE	3.53±0.14	3.78±0.12	3.41±0.18
OXALATE (%)			
CWE	1.65±0.15	2.50±0.16	2.75±0.33
HWE	3.00±0.12	2.60±0.16	2.00±0.23
EOE	2.10±0.33	2.25±0.23	8.13±0.14

Table 2: Composition of Tannin, Total polyphenol, Alkaloid, Saponin and Oxalate in aqueous and ethanolic extracts of *Anarcadium occidentale* (Cashew)

Alkaloids are highly reactive substances with biological activity in low doses. Many alkaloids have remarkable effects on the central nervous system and gastrointestinal tract. The plants under study have high concentration of alkaloids in the leaves and reasonable quantity in the bark and root. This probably shows the inherent danger in consuming large quantity over a short period of time especially in traditional medicine where measurement is either inaccurate or non existing [1]. Furthermore, this forms the basis for the current effort in the standardization of use medicinal plants.

Phenolic compounds have received considerable attention as protective factors against cancer and heart diseases because of their antioxidant potency [18, 19, 20]. This was further buttressed by ability to protect the oxidation of low density lipoprotein cholesterol, a major step in developing artherosclerosis and enhancement of antioxidant [21]. This may also be the rationale behind the use of the extract from the leaves under study as antioxidants (Table 1). The mechanism of action may be the formation of complexes between polyphenol and reactive metals to reduce their absorption when they are in excess in the body. In addition, phenols neutralize free radicals and prevent them from causing cellular damage [20, 22].

Previous studies have reported that phenolic compounds possess other biological activities such as anti-inflammatory, antiulcer, antispasmodic and anti-diarrheal [23, 24]. Cashew leaves have antiulcer and anti-dysentery property while the bark have antimicrobial activity against *H.pylori*, an agent implicated in ulcer [25]. The leaves and barks of guava possess antiulcer properties in addition to antispasmodic activity of the leaves [9]. These properties could be attributed to the phenolic components of the plant parts under study (Tables 1 and 2).

Saponin has been shown to possess beneficial effect by binding cholesterol and ultimately lowering its amount in the body. This culminates in reducing the risk of artherosclerosis and sequel problems [26, 27]. This may make the bark of the plants under study, which showed the presence of this constituent, potential candidates for treating cases of hypertension arising from artherosclerosis. The presence of saponin in the bark and leaves of plants under study (Tables 1 and 2) could be responsible for their use in treating diarrhea [9, 12].

The presence of oxalate in the plants may at a glance be seen to pose athreat a threat to human health. The ingestion of excess soluble oxalate causes some gastrointestinal irritation but the major effect is precipitation of blood calcium and production of hypocalcaemic syndrome of muscular weakness and paralysis [28, 29]. However, the concentration is not sufficient to be deleterious to human health. Furthermore, the beneficial effects of saponin, phenol and tannin on the gastrointestinal tract, and the scavenging potential of polyphenols of heavy metals may counter the seemingly untoward effects of oxalate. This may butress the theory of natural safeguard as proposed by local herbalists. The claim is that isolated or synthesized active compounds, from a whole herb, may be toxic in relatively small doses [3].

In conclusion, the leaves, roots and barks of *Anacardium occidentale* (cashew) and *Psidium guajava* (guava) contain biologically active components that may be responsible for the folkore and scientifically documented medicinally beneficial effects of the plants. Further studies are required to isolate these components with a view to investigating their effects on specific disease conditions

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Conflict of Interest: None Declared

