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Phytochemical and Biological Screening of Catholic Vegetable (*Jatropha Tanjorensis*) Aqueous Extract in Bali, Taraba State, Nigeria

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ABSTRACT

Jatropha tanjorensis has been used as a medicinal herb in treatment and management of disease because they are relatively safer, more affordable and sometimes offers better therapeutic value than synthetic drugs. The study investigated the phytochemical and biological screening of catholic vegetable (*Jatropha tanjorensis*) aqueous extract with the objectives of evaluating some secondary metabolites in the plant using standard qualitative methods and ascertaining the antimicrobial effect of *Jatropha tanjorensis* aqueous leave extract on bacteria of medical importance such as *Pseudomonas aeruginosa, Klebsiella pneumonia, Staphylococcus aureus, Salmonella typhi* and *Escherichia coli* using the agar well diffusion method. The results revealed that the extract of the leaf of *J. tanjorensis* contain some important bioactive components (phytochemicals) in a high amount such as saponins followed by flavonoids, alkaloid and tannins in moderate amount whereas phenol, phlobatannins and glycosides are in low amount. It also shows that the extract was active against *E. coli, P. aeruginosa, S. aureus, K. pneumonia* and *S. typhi* measuring clear zones of inhibition 30.0mm, 22.0mm, 19.0mm, 18.0mm and 17.0mm respectively. Thus, the exhibition of strong antibacterial activity and phytochemical profiles obtained from the analyses of *J. tanjorensis* leaf indicated that it might be recommended for human consumption and adequate amount of consumption could contribute greatly towards meeting human nutritional needs for normal body growth and adequate protection and curative measures to common diseases related to the test organisms.

INTRODUCTION

Plants constitute a pool and storehouse of herbal medicines (Oyewole *et al.*, 2007). In addition, herbal medicines have received greater attention as an alternative to clinical therapy and the demand for these remedies has currently increased (USDA, 2007). Their use is highly dependent on experimental screening to ascertain active components, safety, and efficacy of the plant products (Oyewole *et al.*, 2007; Igbinaduwa *et al.*, 2011).

Jatropha Tanjorensis Plant

Description of *Jatropha Tanjorensis*

Jatropha tanjorensis is a multipurpose perennial shrub/small tree of 3-6 m height. The word 'Jatropha' is derived from Greek words 'Jatros' and 'trope' (food/nutrition) which implies medicinal uses. The genus Jatropha belongs to family Euphorbiaceae and subfamily Acalyphoideae and includes about 175 species. It may be evergreen or deciduous, depending on climate. It has a short tap root, robust laterals and many fine tertiary roots. The stem is woody, erect, cylindrical, solid and branched. Branches are stout, green and semi woody. Leaves are palmate and have 5-7 shallow lobes and are arranged in alternate with spiral phyllotaxis. Length and widths of leaves varies from 16-21 and 14-18 cm and are cauline and ramel, ex-stipulate, petiolate. Petioles are 12-19 cm long (Akhilesh & Tewari, 2015).

Figure 1: Picture of *Jatropha Tanjorensis* (*Source: Fieldwork 2023*)

Taxonomy/Classification of *Jatropha Tanjorensis*

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Malpighiales
Family	Euphorbiaceae
Genus	Jatropha
Species	*Jatropha tanjorensis*

Common Names: Catholic vegetable, Lapalapa or Iyana-Ipaja (Yoruba), Ugu-Oyibo (Igbo), "hospital too far" (Pidgin English) (Ochulor, Njoku, Uroko & Egba, 2018).

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Binomial name: *Jatropha tanjorensis* J.l. Ellis and Soroja (GBIF Secretariat, 2021; USDA PLANTS, 2007-2010).

Importance and Uses of *Jatropha Tanjorensis*

Jatropha tanjorensis Ellis & Saroja is among these screened plants, which belongs to genus of flowering plants in the spurge family, Euphorbiaceae (Carlasabandar, 2010). It is a multipurpose plant, nurtured for medicinal applications and used as food. Almost every fragment of the plant is useful and nutritional in several ways. Its many benefits depend on which part of the plant is being used. The leaves are generally cooked and eaten like vegetables such as fluted pumpkin leaves (Ugu) and spinach (Nwachukwu, 2018). J. tanjorensis mainly use is for fencing, and as a source of edible leafy vegetables and natural medicinal therapy against ailments which include diabetes in many parts of Southern Nigeria (Iwalewa *et al.*, 2005).

Jatropha tanjorensis possesses important pesticidial, anticancer and hepatoprotective activity. The sap from stem stops itching, scratches and bleeding of cuts. The root decoction is used as a mouth wash for treating bleeding gums, toothache, ringworm, eczema and scabies and also treat dysentery and venereal diseases (Nwachukwu, 2018). The leaf aqueous extract is consumed as a blood tonic with the claim that it increases blood volume. It can also be used as alternate to lettuce in salad preparation amongst other very vital usages as reported by many authors (Igbinaduwa *et al.*, 2011).

The oxidant potential of the plant extract has been examined and to have antioxidative potential against reactive oxygen species produced in protein energy malnutrition. The seed oil of *J. tanjorensis* is used for the treatment of paralytic and rheumatism affections. Traditional medicine practitioners use the root in the treatment of urinary tract infections and sexually transmitted infections. It is also used for irregular periods, to treat menstrual pains, and to ensure a strong foetus during pregnancy (Nwachukwu, 2018).

Notwithstanding the countless potentials of *Jatropha tanjorensis* as a therapeutic plant has not found a wide application in pharmaceutical systems. Its usage has mostly been restricted due to insufficient scientific information on the plant. Hence, this study aimed to evaluate the phytochemical and biological screening of catholic vegetable (*Jatropha tanjorensis*) aqueous extract.

MATERIALS AND METHODS

Study Area

The study was carried out in Federal Polytechnic Bali, Bali Local Government Area (LGA) of Taraba State, Nigeria (see Fig.2). The Local Government Area lies between latitude 7046 N and 7054 N of the equator and longitude 10 030 E and 110 00 E of the prime meridian (Topographic sheet, 1968). This falls within the dry guinea savannah with an estimated land area of 11,540 km2. It has some mountains like Gazabu, Dakka, Maihula, Bagoni, among others. Based on the 2006 National Population Census, Bali had a population of about 211,024 persons (NPC, 2006).

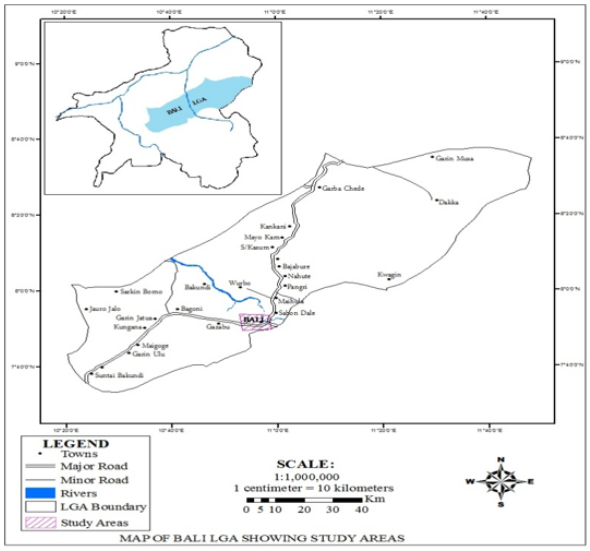

Figure 2: Map of Bali Local Government Area showing the study Area (*Source: Bureau for Land and Survey Jalingo, Taraba State*)

Thermostated water bath, Electronic balance (Model: 3003H),Hot plate (Model: ORL 2080), Oven (Thermcool), Desiccators, Cotton wool, Filter paper, Pestle and mortar, Glass wares (volumetric/conical flask, beakers, funnel), Jatropha tanjorersis leaves

Reagents/Chemicals

Methanol, Diethyl ether, Ammonia solution, Mayer's regent, Wagner's regent, Iron (III) Chloride, Hydrochloric acid, Ethanol, Acetic acid, Tetraoxosulphate (vi) (H2SO4) acid, Sodium hydroxide (NaOH)

Collection and Identification of Jatropha Tanjoresis

Fresh Jatropha tanjoresis leaves were harvested from Rest house residence in Bali L.G.A of Taraba State, in the in the month of April, 2023 and identified using pertinent taxonomic literatures (GBIF Secretariat, 2021; USDA PLANTS, 2007-2010). The harvested leaves were sorted and then washed with clean water to remove dirt and unwanted materials that may be adhering on the leaves and after washing. The samples were air dried at room temperature on the laboratory table of Science Laboratory Technology Department, Federal Polytechnic Bali and after drying, it was then milled using pestle and mortar and the powder obtained were used for analyses.

Aqueous Extraction Preparation of Jatropha Tanjoresis Leaves

100 gm of fine powdered sample of Jatropha tanjoresis was weighed and mixed with 500 mL of distilled water in a round bottom flask and then the reflux condenser apparatus was setup. A reflux condenser was attached to the flask and inserted with a heating mantle. The mixture was refluxed for one hour and filtered with Watman filter paper No. 1. The reflux was done again using new distilled water at each stage. The filtrate was heated to dryness by

evaporation. Part of the dry filtrate (extract) was used for phytochemical and antimicrobial screening.

Analyses

Determination of Phytochemicals

Alkaloid, phenol, phlobatannins, flavonoids, saponins (Froth test), volatile oils and tannin were determined using qualitative methods described by Trease & Evans (2009).

Microorganisms

The bacteria used are known to be potentially pathogenic to humans. They include Salmonella spp., Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Klebsiella spp. All the organisms' strains were obtained as clinical isolates from Sancta Maria Clinic, Bali, Taraba State and Optimum Laboratory, Jimeta-Yola, Adamawa State, Nigeria.

Antimicrobial Susceptibility Testing

The antibacterial activity of Jatropha tanjorersis leaf extracts (100mg/ml) in vitro on the isolates was determined by the agar well diffusion method as described by (Olakunle *et al*., 2013: Osho & Bello, 2010). This was done using pour plate method in which small colonies from each clinical isolates of the test organisms were made into suspension with 1ml of sterile distilled water in test tubes. 0.1ml of each suspension was dispensed into sterile petri dishes after which melted and sterilized nutrient agar maintained at 450C was poured (15 aliquot) into the respective plates. The plates were allowed to set, four equidistant wells of 6mm in diameter were punched in each plate using a sterile cork borer. 0.2ml of extract was introduced into each of the wells. A well filled with sterile water served as control and the plates were allowed to stay for15 minutes for pre-diffusion to take place followed by incubation for 24-48 hrs at 370C. The zones of inhibition were measured with the use of a metric rule and were recorded in centimeters (millimeters).

Table 1: Phytochemical Screening of *Jatropha tanjorensis* Leaves Aqueous Extract

Chemical Constituent	Confirmation
Phlobatannins	+
Saponins	+++
Glycosides	+
Alkaloids	++
Phenols	+
Flavonoids	++
Tannins	++
(+++= Highly Detected, ++= Moderately Detected, += Lowly Detected -= Not Detected)	

RESULTS AND DISCUSSION

DISCUSSION

The result of the phytochemical screening of the *Jatropha tanjorensis* leaf aqueous extract is presented in Table 1.

Table 2: Antimicrobial activity of *Jatropha tanjorensis* Leaves Aqueous Extract against some bacteria isolates

Organisms (Bacteria)	Dose (ML)	Zone of Inhibition (MM)
Staphylococcus aureus	0.2	19
Salmonella typhi	0.2	17
Escherichia coli	0.2	30
Klebsiella pneumonia	0.2	18
Pseudomonas aeruginosa	0.2	22

The tannin content of the *J. tanjorensis* leaf sample was moderately detected. According to Ujonwundu *et al.* (2010) and WHO (2002), tannins have antioxidant effects which help in prevention of cancer and a level below 5mg/100g in foods are safe for human consumption. Flavonoids are free radical scavengers and potent water-soluble super antioxidants (Onimawo & Akubor, 2012). Flavonoid was moderately detected in the leaf extract of *J. tanjorensis*. Though, moderate consumption of flavonoid is essential for normal heart beat, metabolic and neuromuscular activities. It also protect against all stages of carcinogenesis, prevents oxidative cell damage and have strong anticancer activity (Bello *et al*., 2008).

The alkaloid content of the *Jatropha tanjorensis* leaf sample was moderately detected. Alkaloids are medicinal and important secondary metabolites. Alkaloids isolated in pure form and their synthetic derivatives are used as basic medicinal agents for their analgesic and bactericidal effects (Morton, 2001). Saponin was highly detected in the aqueous leaf extract of *J. tanjorensis*. Some properties of saponins include cholesterol binding properties, formation of foams in aqueous solution, bitterness and hemolytic activity (Sodipo *et al*., 2000). However, saponins' anti-microbial activities make them good for treating yeast and fungal infections (Okwu & Ndu, 2006). Though, high level of saponin has been associated with gastroenteritis manifested by diarrhoea and dysentery (Gernah *et al*., 2007), acute poisoning is relatively rare (Awe & Sodipo, 2001). However, these toxic principles exhibit useful medicinal properties (Afiukwa & Igwe, 2015). Thus, the presence of some important phytochemicals highly detected (saponin), moderately detected (tannin, flavonoid and alkaloid) and lowly detected (phenols, glycosides and Phlobatannins) in the *Jatropha tanjorensis* leaf is an indicator to the medicinal value of the plant.

Table 2. show the result of the antimicrobial activity of *J. tanjorensis* leaves aqueous extract against five isolated bacteria identified to be pathogenic to humans. The extract exhibited effective antibacterial action against the isolated bacteria by their clear zones of inhibition identified as pathogenic to humans. E. coli displayed greater level of susceptibility 3.0cm (30mm) than other tested bacteria. Followed by P. aeruginosa with level of susceptibility 2.2cm (22mm). S. aureus, K. pneumonia and S. typhi indicated the least zone of inhibition 1.9cm,

1.8cm and 1.7cm (19mm, 18mm and 17mm) respectively. The most resistant isolate tested was S. typhi with the least zone of inhibition of 1.7cm (17mm).

CONCLUSION

The study revealed that the aqueous extract of the leaf of *J. tanjorensis* contain saponins in high amount followed by flavonoids, alkaloid and tannins in moderate amount. In contrast, phenol, phlobatannins and glycosides is in low amount. It also shows that the extract was active against *E. coli, P. aeruginosa, S. aureus, K. pneumonia and S. typhi* measuring clear zones of inhibition 30.0mm, 22.0mm, 19.0mm, 18.0mm and 17.0mm respectively. Thus, the display of strong antibacterial activity and phytochemical profiles of *J. tanjorensis* leaf showed that it may be recommended for human consumption and adequate amount consumption could contribute greatly towards meeting human nutritional need for normal body growth and adequate protection and curative measures to common diseases related to the test organisms.

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