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Antimicrobial Potential of *Jatropha Curcas* Extract Compared to Some Selected Antibiosis

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Abstract:

Aqueous extracts of stem and root bark of *Jatropha curcas* were qualitatively screened for phyto-compounds and investigated for antimicrobial activity using agar well diffusion method on *staphylococcus aureus*. Phytochemical components such as flavonoids, alkaloids, tannins, anthraquinones, saponins, cardiac glycoside and terpenoids were detected. The extract at various concentrations showed variable antimicrobial activity against test organism, with the root bark extract showing higher antimicrobial activity compared to the stem bark extract having a significant difference $P > 0.05$. The root bark exhibited zones of inhibition of 1cm, 1.38cm and 1.57cm at 40mg/ml, 80mg/ml and 160mg/ml concentration respectively. The zones of inhibition distance were less compared to positive control (Ciprofloxacin, Erythromycin and Ampicillin) which had 2.52cm, 2.08cm and 1.62cm zones of inhibition at the same concentration. Stem bark of the same plant extracts showed zone of inhibition of 0.52cm, 0.64cm and 0.76cm. The plant stem and root bark extracts were found to exhibit antimicrobial activity. The inhibitory effect of the extracts on the test organism can be attributed to the available phytochemical components detected in the extracts.

Keywords: Aqueous extract, phytochemicals, *jatropha curcas*, antimicrobial activity, agar diffusion, *staphylococcus aureus* and antibiotics

1. Introduction

Medicinal plants are of great important to the health of individuals and society. The medicinal values of these indigenous plants are due to the presence of chemical substance that produces definite physiological action on the human body (Edeoga and Gamina, 2000). A great number of Nigerian higher plants are traditionally noted for their medicinal and pesticidal properties (Okwute and Takedo, 1985) but regrettably, only few have been studied for active constituents. Plants generally produce many secondary metabolites which constitute an important source of microbicides, pesticides and many pharmaceutical drugs. In traditional medicines, plants are administered as entire plants, leaves, roots, stem bark, seeds, fruit juice, flowers and may be taken inform of an infusion or crude concoction; thus, the medicinal plants used by African traditional healers are not selected on the basis of their chemical constituents but rather on their ability to restored patient disease condition(s). The use of plants as antimicrobial agents is gradually attracting attention probably due to the high cost, unavailable and toxicity of the modern drugs. Antimicrobial's activity of substance is the ability of such substance to either kill microorganisms or prevent their growth (Madigan *et al.*, 1997) *Jatropha curcas*, in English punging nut while in Hausa *Kokolwaje* is a species of flowering plant in the spurge family, *Euphorbiaceae* that is native to the American tropics, most likely, Mexico and Central America. It is cultivated in tropical and subtropical regions around the World, becoming naturalized in some areas, specified name *curcas*, was first used by Portuguese doctor Garcia Deorta long ago and is of uncertain origin. Common names include; Barbadors nut, purging nut, and Physic nut. Medicinally, this plant is known to have many chemotherapeutic potentials such as anti-fungal, antibacterial activities and hepatoprotective effect ethanomedically. It is also used for the treatment of diseases like cancer, piles, snake bite paralysis, dropsy (Prasad *et al.*, 2009). Therefore, a continued effort to investigate Nigerian higher plants for their medicinal activities is continual processes. This work is designed to evaluate chemical classes of compounds present in the aqueous extracts of the stem and root bark and evaluate their respective activities against *Staphylococcus aureus* in comparisons with some standard anti-biotic drugs *in vitro*.

2. Materials and Methods

2.1. Plant's Material

Plant used for this study was collected from Gashala Hong local Government Area Adamawa State Nigeria. The plant was identified at Biological Sciences Department of Adamawa State University Mubi.

2.2. Processing and Extraction of the Plant's Materials

Stem and root bark of the plant were obtained and were dried in shade at room temperature to avoid possible loss of volatile substance when dried under the sun. After drying, it was pound into powdered using wood mortar and pistle. One hundred grams (100g) of the powdered sample was macerated in 400ml of water in a conical flask for 48hours. The mixture was filtered through whatman No 1 filter paper. The filtrate was concentrated in a water bath at 45°C after which the filtrate was transferred into a sample bottle and stored in a refrigerator prior to further analysis.

2.3. Preparation of the Extract Concentration

Different concentrations of each extract (stem and root bark) were prepared as follows: 10mg/ml, 20mg/ml, 40mg/ml, 80mg/ml and 160mg/ml respectively.

2.4. Preparation of Anti-Microbial Disc

Whatman filter No 1 was perforated using file puncher and dispensed in screw caped bottle. They were sterilized in an oven at 160 °C for two hours. Several dilutions of 10mg/ml, 20mg/ml, 40mg/ml, 80mg/ml and 160mg/ml respectively and the sterilized disc was saturated with the various concentration of the extract using aseptic technique.

2.5. Sensitivity Testing

The nutrient agar was prepared according to the manufacturer instruction as 20ml was dispensed into labeled petri-dishes and was allowed to solidity. A colony of the test organism was picked using a sterile wire loop and inoculated into 10ml sterile peptone water and 0.1ml of the inoculums was transferred into the molten nutrient agar and poured into plates and swilled for homogenous distribution and allow to stand for 30minutes. The disc saturated with the plant extracts were picked and placed on the plates and allows standing for 30minutes and incubated at 37 °C for 24 hours. The antibiotic paper disc of ciprofloxacin (cpx), ampicillin (Amp), Ampiclox (Apx), Erythromycin (Ery) and Chloramphenicol (Clp) were used as positive control, while distilled water was used as negative controls and was incubated alongside with the disc saturated with the plant extract as described by Barry and Thonsberry (1995).

2.6. Zone of Inhibition

The zone of inhibition in the radius or diameter over the growth of microorganism inhibited as a result of the presence of an antimicrobial agent.

2.7. Phytochemical Screening

Phytochemical screening for major constituents was undertaken using standard qualitative methods described by Odeyi and Sofowora (2008). Harbone (1976), Trease and Evans (2002). The plants extract was screened for the presence of cardiac glycoside, alkaloids, flavonoids, tannins, saponins and terpenes.

2.8. Test Organism

Test organism used for the investigation was clinical isolates of *Staphylococcus aureus* which was obtained from New Life Hospital Mubi Adamawa State Nigeria.

3. Results and Discussion

The phytochemical components of the *Jatropha curcas* are presented in Table 1. Result obtained from the qualitative phytochemical screening on extract shows that both stem and root bark contained a wide array of phytochemicals. These include saponins, tannins, flavonoids, anthraquinones and alkaloids. Identifying the phytochemical constituent present had helped to speculate on the medicinal activity of both the root and stem bark. The presence of almost all the phyto-compounds in the root bark is responsible for its higher antimicrobial activity to that of the stem bark.

Test	Stem Bark Extract	Root Bark Extract
Reducing sugar	-	-
Anthraquinone	+	+
Terpenoids	+	+
Flavonoids	+	+
Saponins	+	+
Cardiac glycoside	-	+
Tannins	-	+
Alkaloids	+	+

Table 1: Phytochemical Screening Results

Flavonoids have been reported to have anti-bactericidal or antimicrobial properties (Tsuchiya *et al.*, 1996). Tannins have antimicrobial (Ya *et al.*, 1988) and antioxidant properties of crude extract from *Sorghum bicolor* and antimicrobial activity (Seotan *et al.*, 2006). Alkaloids have pronounced physiological effect on the nervous system (Sofowora 2008; Levetin and Mc Mahon, 2003). All these are present in the root bark, whereas in the stem bark tannin and cardiac glycoside were found to be absent.

The zone of growth inhibition of aqueous extract of *J. curcas* extracts on the test organisms is shown in Table 2. Results showed that the extracts show activity against *S. aureus*. The extract activity was exhibited by the root bark at 40mg/ml with zones of growth inhibition 1cm, while 80mg/ml and 160mg/ml have their zones of growth inhibition as 1.38 and 1.57cm respectively. At this level the extract activity was less to that of positive control (Ciprofloxacin, Erythromycin and Ampicillin) which has 2.52, 2.08 and 1.62cm zones of growth inhibition against the test organism (*S. aureus*). Stem bark aqueous extracts showed activity against *S.aureus* with 40mg/ml zone of inhibition of 0.52cm, while 80mg/ml and 160mg/ml has, the zones of growth inhibitions 0.64cm and 0.76cm respectively, less activity compared to the root bark extract. The differences in phytochemical result i.e. the absence of tannins and cardiac glycoside in the stem bark extract is liable to be responsible for the reduction in the zone of inhibitory activity.

The antimicrobial activity exhibited by this plant is attributed to the phytochemical's contents, and differences in activities are related to the differences in the phyto-compounds present. The presence of flavanones, alkaloids and tannins serves as an index of exhibiting inhibitory activity (Tsuchiya *et al.*, 1996; Seotan *et al.*, 2006; Ya *et al.*, 1988). This is an indication that the root bark could be a good first line drug for bacterial especially *staphylococcus specie* infection. This result is still in line with the use of stem and root bark of *J. curcas* to cure several diseases especially those caused by bacteria.

Concentrations (mg/ml)	40	80	160		
Stem bark zone of inhibition (cm)	0.52	0.64	0.76		
Root bark zone of inhibition (cm)	1.0	1.38	1.57		
Standard anti-biotic paper disc	Cpx	Ery	Clp	Amp	Apx
Zone of inhibition (cm)	2.52	2.08	0.32	1.62	1.24

Table 2: The Zone of Inhibition for the Standard Drugs, Aqueous Extracts of Root and Stem Bark of *Jatropha Curcas* on *Staphylococcus Aureus*

Figure 1: The Effect of *Jatropha Curcas* Stem and Root Bark Extract on *Staphylococcus Aureus* Compared To Some Antibiotics

KEY:

Ampiclox (Apx)
Ampicilin (Amp)
Chlorophenical (Clp)
Ciprofloxacin (Cpx)
Erythromycin (Ery)

The high mean zone diameter measured for the *Staphylococcus* isolate was noticed in the root compare to stem crude extract which range from 1.0 - 2.01cm. It is of interest, because, bacterial resistance to antibiotic is a problem facing the World of medicine today. Substances that significantly control the activity of resistant strain of bacteria are highly esteemed; the root and stem bark of *Jatropha curcas* was effective.

The concentrations for the extracts were higher to standard drugs, due to the fact that extract is a mixture of pharmacologically and non-pharmacologically active components, but the standard antibiotics were purified and quantified. Their zone of inhibition measured for the extracts are within reasonable range to that measured for the standard drugs, indicating that the further isolation and purifications of the extracts will possibly increase activities which are common to past studies. It will be necessary to purify the extracts and isolate the active component for adequate formulation, which may result in discovering its other medicinally useful properties.

Further work on aqueous extract to isolate, characterize and identification of the active constituents of this plant is recommended. This is to view and determining its spectrum of activity as well as adding it to already substances with antimicrobial agents especially those that are active against resistant strain of bacteria.

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