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RESEARCH ARTICLE

ASSESSMENT OF THE ANTIOXIDANT AND ANTIBACTERIAL ACTIVITIES OF PETIVERIA
ALLIACEA AND VISCUM ALBUM (MISTLETOE).

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Abstract

The antioxidant and antimicrobial activities of the methanolic extracts of Petiveriaalliacea (Garlic guinea weed) and Viscum album (Mistletoe) from cocoa (Theobroma cacao) were investigated. Both samples showed good levels of DPPH radical scavenging activity with IC₅₀ of 0.116mg/ml and 0.120mg/ml for V. album and P. alliacea respectively. The extract of V. album inhibited Pseudomonas aeruginosa, Escherichia coli, Klebsiellasp., Salmonella sp., Shigellasp., Proteus sp., and Staphylococcus sp. with zones of inhibitions ranging from 3 to 25mm at extracts concentrations of 62.5, 125, 250 and 500mg/ml. The zones of inhibitions for P. alliacea ranged from 3 to 24mm for the same extract concentrations. V. album have the highest inhibition against E. coli and least inhibition against Staphylococcus sp., while P. alliacea have the highest inhibition against Shigellasp. And the least inhibition against Staphylococcus sp.

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Introduction:-

Potential of herbs and other plant-based formulations have been increasingly recognized in prevention and treatment of human diseases including cancers. The discipline of ethnopharmacology, the study of biologically active agents traditionally employed or observed by man, has in recent years received increased attention, and there is presently a widespread interest in medicinal plants used by different cultures.

Extracts from plants have been found to contain minerals and primary metabolites but not only these; they have also been found to contain a diverse array of secondary metabolites with antioxidant potential and these have made the medicinal value of plants to assume a more important dimension in the past few decades (Akinmoladun et al., 2007). Antioxidant substances act as protective shield for our bodies against certain diseases like cardiac disease, atherosclerosis, cancer and in the aging (Marturet et al., 2011). This they do by removing the deleterious effect of free radicals within our body. They slow or retard the organic matter oxidation promoted by these free radicals by removing the excess free radical intermediates and inhibit other oxidation reactions by going through oxidation themselves (Fasola et al., 2011). Free radicals are involved in the pathogenesis of a large number of diseases thus a potent scavenger of free radicals may serve as a possible preventive intervention for diseases (Charturvediet al., 2015).

Several plants and vegetables which are used in traditional medicine for therapeutic purposes have antioxidant activity and their therapeutic effect have been attributed to their antioxidant activity.

Petiveriaalliacea is a species of flowering plant in the pokeweed family, phytolaccaceae (Wikipedia, 2015). It is a native to Florida and the lower Rio Grande valley of Texas in the United State, Mexico, Central America. It is commonly called Guinea Hen Weed the Yorubas call it Ewesoro.

The plant has several applications both in medicine and industry. It is used in teas, extracts and capsules. It has been used to reduce inflammation and pain. It has antibacterial ability, antifungi and antiviral effects (Schmelzer and Gurib- Fakim, 2008).

Schmelzer and Gurib- Fakim (2008) have revealed that the plant has tendency to reduce blood sugar level and also eliminate cancer cells. The plant is also used as bait and insect repellent (Wikipedia, 2015).

Mistletoe (*Viscum album*) popularly called Afomo by the Yorubas is an evergreen semi-parasitic plant normally found growing on a variety of trees; especially pines, cocoa etc. Mistletoe belongs to the family santalaceae and there are different species of the plant.

Extract of this plant have been used for cancer therapy, this was due to the immunostimulatory and cytotoxic properties of the plant (Eggenschwiler et al., 2007). It has been used as anticancer, antidiabetic, antihypertensive and as all-purpose herb (Kafanu, 1993). It is used in Ondo State as topical antibiotic in form of pastes for the treatment of wounds and other skin infections (Yusuf et al., 2013a).

Synthetic antibacterial used nowadays are associated with different complications leading to different diseases like blood cancer and upper gastrointestinal complications. Not only that, they are expensive and are not within the reach of the poor masses, there is therefore need for cost effective and natural antibiotic. Some of the underutilized plants grown in Nigeria have these properties.

The aim of the present study was to assess the antioxidant and antimicrobial activities of these plants and to compare their activities.

Materials and Methods:-

Collection of Samples:-

Fresh leaves of *Viscum album* (mistletoe) from the host, *Theobroma cacao* (cocoa), and the *Petiveria alliacea*, were collected from different locations in Ekiti State and identified in the herbarium section of the Department of Plant Science, Ekiti State University.

Extraction of Samples:-

100g of each powdered samples was extracted with 200ml of concentrated methanolic solution. The mixture was left in the dark for 72 hours after which it was filter and the filtrate was concentrated using rotary evaporator.

Antioxidant Potential Determination:-

The free radical scavenging ability of the samples against 1, 1-diphenyl -2- picrylhydrazyl (DPPH) free radical was evaluated as described by Gyanfinet al., (1999) with slight modification. Briefly 1ml of 3.9mg /100 ml of the methanolic solution containing DPPH radicals was mixed with different volumes of 0.1µl/ml of the methanolic extract of the samples, the volumes of the samples used ranged between 50-200ml. The mixture was left in the dark for 30min and the absorbance was measured at 516nm. BHT was used as positive control. The DPPH free radical scavenging ability was subsequently calculated with respect to the reference and the IC₅₀ was also calculated. The percentage DPPH radical-scavenging activity was calculated as:

$$\frac{Abs_{ref} - Abs_{sam}}{Abs_{ref}} \times 100$$

Where:

Abs_{ref} – Absorbance of reference; Abs_{sam} – Absorbance of sample

Determination of Antibacterial Activity:-

The antibacterial activities of the methanolic extracts were determined using the agar diffusion method as described by Faleyee et al., (2015). Antibacterial activity was assessed by measuring the diameter of the zone of clearance to the nearest whole millimetre.

Results and discussions:-

The scavenging ability of each methanolic extracts against stable DPPH in methanolic solution is presented in Figure 1. The result followed a dose –dependent pattern, the methanolic extract of *V. album* (Mistletoe) IC_{50} of 0.116 mg/ml performed better than *Petiveriaalliacea* with 0.120 mg/ml. Nevertheless, this activity are slightly lower than that of BHT used as positive control ($IC_{50} = 0.072$ mg/ml). This showed that *V.album* had better antioxidant activity than *Petiveraalliacea*. This result is in agreement with the result of Yusuf et al., (2013b) on the antioxidant of mistletoe grown on cola.

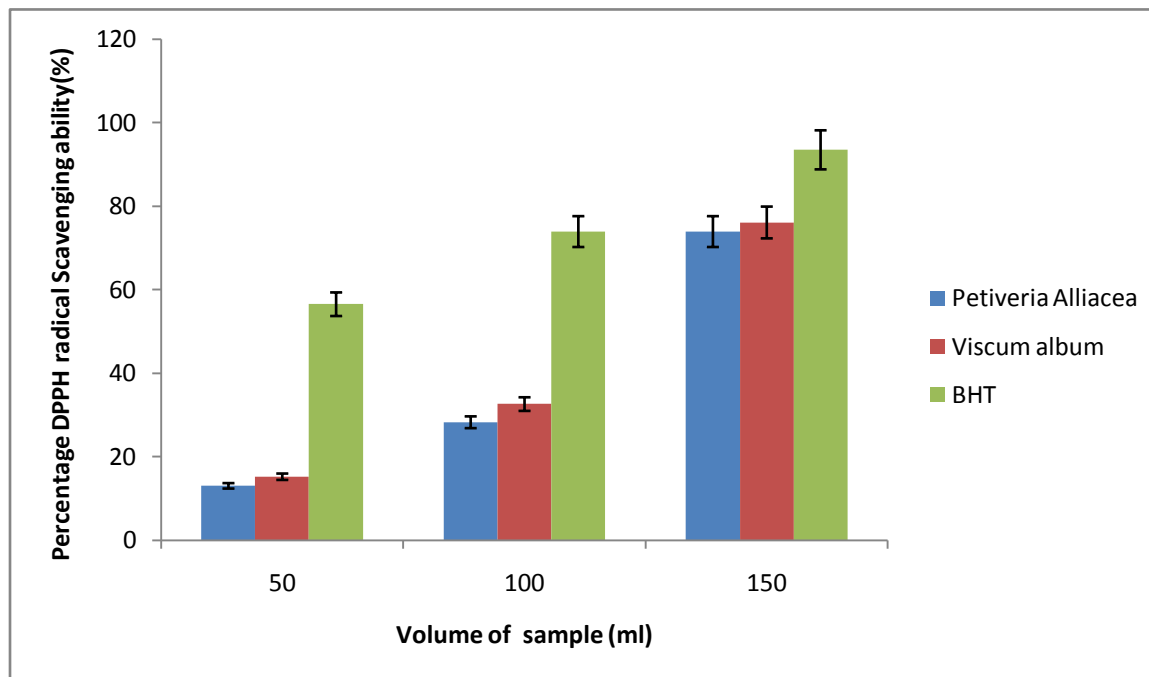


Fig.1:- Percentage radical scavenging activity of *Viscum album* and *Petiveriaalliacea*

The effect of antioxidants on DPPH radical scavenging activity was thought to be due to their hydrogen donating ability. Antioxidants perform their protective function on living cells by preventing the production of free radicals or by neutralizing the free radicals produced in the body (Oboh and Rocha, 2007).

Figures 2 and 3 reports the inhibition zones of *V. album* and *P. alliacea* for seven strains of Gram-positive or Gram-negative bacteria using the diffusion technique on solid media as well as the results of the antimicrobial activities of *Viscum album* and *Petiveriaalliacea* extracts in agar diffusion method against the concentrations of 62.5mg/ml, 125mg/ml, 250mg/ml 500mg/ml. The extract of *V. album* demonstrated higher antimicrobial activities against *Pseudomonas aeruginosa*, *Escherichia coli*, and *Klebsiella sp.* than the activities of *P. alliacea* against the microorganisms with the same concentrations. *V. album* at concentration of 62.5mg/ml, showed inhibition against the gram-negative bacteria *P. aeruginosa* and *Klebsiella sp.* but *P. alliacea* did not show any inhibition against the organisms. This showed that even at low concentration; *V. album* can still inhibit these bacteria.

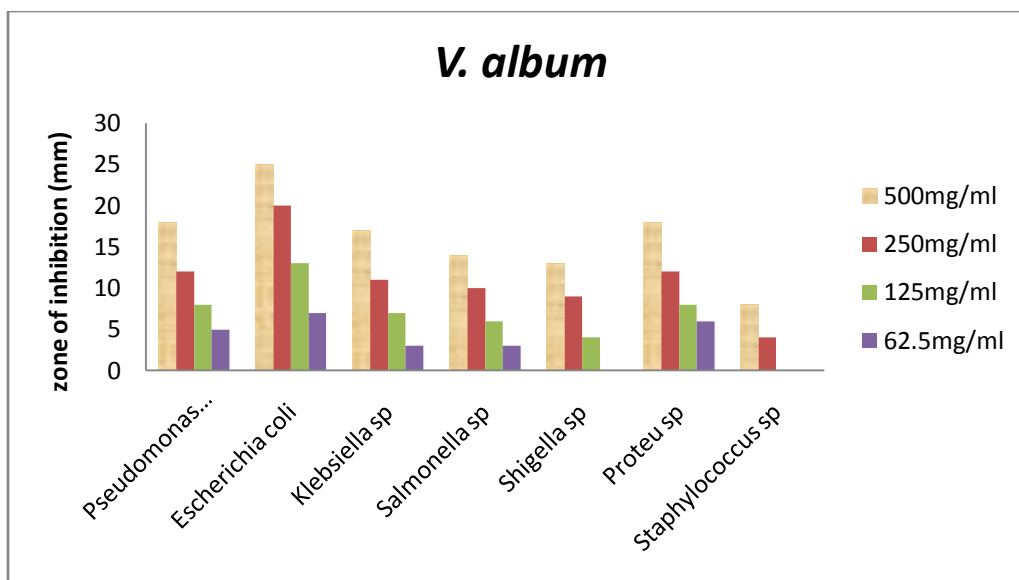


Fig. 2:- Antimicrobial activity of *V. album*.

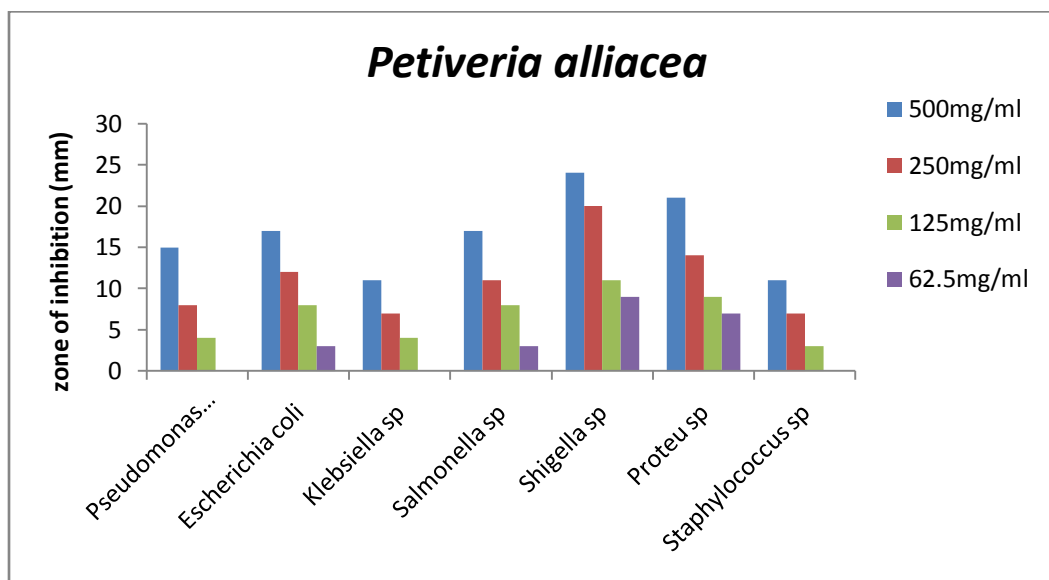


Fig 3:- Antimicrobial activity of *P. alliacea*.

The DPPH radical scavenging activity and antioxidant activity of *V. album* extract were comparable to those of *P. alliacea* which has been notably known as a world acclaimed anticancer agent (Schmelzer and Gurib, 2008; Johnson, 1999). In contrast to the relatively low inhibition of *V. album* for gram – positive bacteria belonging to the general *Staphylococcus sp*; *Pseudomonas*, *Escherichia*, *Klebsiella*, *Salmonella* and *Proteus* were inhibited by *V. album* with zone of inhibition ranging from 3 to 25mm. Our findings showed that where *P. alliacea* is not available *V. album* can also be used as anticancer and antiviral agent owing to its antioxidant and antimicrobial activity. The antioxidant and antimicrobial abilities of these two underutilized plants justify their various traditional uses.

Conclusion:-

The free radical scavenging ability and antimicrobial activities of these samples are indication that they have good antioxidant and antibacterial properties. They are natural and economic sources of antioxidant and antibacterial, therefore they can find better application in food industry, pharmaceutical industry and medicine.

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