Advancement in Medicinal Plant Research
Vol. 3(3), pp. 75-86, July 2015
ISSN: 2354-2152
Review

Administration of cashew extracts in the treatment of some infections and diseases

Aderiye B. I.*, David O. M. and Atere V. A.

Microbiology Department, Ekiti State University, Ado-Ekiti, Nigeria.

Accepted 24 June, 2014

ABSTRACT

The cashew, *Anacardium occidentale* (L), has been reported for its usage in many life applications. Some of the medicinal uses of cashew include the antimicrobial effect of extracts of the leaves, apple, stem and the nut shell oil against many microorganisms including *Escherichia coli*, *Candida albicans*, *Ascaridia galli* and *Leishmania* sp. The anti-microbial activities of cashew extract involve the anti-bacterial, antifungal, anti-helminthics, anti-protozoan and anti-viral. The phytochemicals present in cashew extracts such as anacardic acid, flavonoid and tannins are responsible for the anti-microbial activities of the extract by inactivation of microbial adhesions enzymes and cell envelop transport cells, flavonoids, which are responsible for the inhibition of DNA gyrase thereby inhibiting DNA synthesis; phenolic compounds like anacardic acids, cardols, triterpenoids, methylcardols, xantoprotein and cardanols that are responsible for bacteria cell wall inhibition, by inhibiting the cell wall synthesis in addition to a growing cell and blocking the DNA, RNA and protein pathways. The extracts of cashew have also been used in treating gastro-intestinal tract syndromes such as diarrhea, dysentery, dyspepsia and nausea. Allergies and inflammation syndromes are also managed by administration of extracts from cashew; tannins inhibit the migration of leucocytes to an inflammatory site thereby reducing inflammatory response; on the other hand flavonoids present in extracts of cashew inhibit the cyclo-oxygenase, which is important in the genesis of edema and pain. Cardiovascular diseases are often treated by extract of cashew because of the presence of phenolic compounds that are antioxidant in nature. The endocrine diseases are also being treated by cashew extract as in the case of diabetes mellitus. The presence of saponin, flavonoids, alkaloids, phenols, anacardic acid and tannin had been reported to increase the regeneration rate of the beta cells. The anacardic acid from cashew nut can also inhibit the growth of some cancerous cells, also agathisflavone was shown to be cytotoxic against malignant cell lines. A likely mechanism of action of agathisflavone would be by inhibition of cyclic nucleotide phosphodiesterases (PDEs). This paper discusses the usefulness of cashew in addressing many human medical challenges; without the use of synthesized drugs.

Keywords: *Anacardium occidentale* L., anacardic acid, cashew, ethanol extract, water extract, flavonoids, tannin.

*Corresponding author. E-mail: jadesolaaderiye@yahoo.com.

INTRODUCTION

Cashew (*Anacardium occidentale*) tree has been used medicinally worldwide. The bark, leaves and shell oil of the plant are used medicinally to treat different ailments (Agedah et al., 2010*).* Cashew nuts are regarded as a first class energy source, and have anti-toxin, anti-enteric and anti-diuretic properties (Rakoto-Ratsimamanga, 1968*;* Rain-tree, 1996; Greencottage, 2000). It contains vitamins and unsaturated fatty acids (Oleic acid 73.3% and Linoleic acid 7.67%). All the parts of the plant (apple, bark, leaves, gum, nut and roots) have different ethno-medicinal uses for both man and animal alike (Ramiakajato et al., 2001).

Recently interest in medicinal plants has increased tremendously especially on their effects on human beings (Ojezele et al., 2013). Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects (Oyesomi and Ajao, 2011). The bark, leaf, nut, fruit apple and the extracts from these

plant parts have been used medically (Ijeh et al., 2010). The anti-microbial activity of the cashew leaf extract has been documented by several researchers (Omojasola and Awe, 2004; Agedah et al., 2010; Ifesan et al., 2013), where the anti-bacterial, anti-fungal, anti-protozoan, anti-helminthic and anti-viral activities of various part extract of cashew were recorded. Different parts of the cashew plant have been used in the treatment of allergies/ inflammations, GIT syndromes, endocrine defects, cardiovascular problems, respiratory tract dysfunctions and in the treatment of cancerous growth and tumor.

It is a multipurpose tree, whose leaves, stems and bark extracts are used extensively for the treatment of different diseases (Arekemase et al., 2011). It has also been reported to possess anti-diabetic, anti-inflammatory and anti-ulcerogenic properties (Akinpelu, 2001). The ethanolic extracts of cashew nuts revealed the presence of various phytochemical compounds such as triterpenoids, phenolic, flavonoids, and xantoprotein which are responsible for its antimicrobial nature (Rajesh et al., 2009). The liquid obtained from the shell of cashew nut (CNSL) has wide commercial applications and medicinal properties (Murthy and Sivasamban, 1985).

ANTIMICROBIAL PROPERTIES OF CASHEW

Table 1 shows a brief summary of the antimicrobial properties of cashew and its component parts

Antibacterial activity

The use of cashew extracts in treating human bacterial infections.

Leprosy

This is a chronic infection caused by *Mycobacterium Leprae* and *Mycobacterium lepromatosis* that may result in a lack of ability to feel pain and thus loss of parts of extremities due to repeated injuries (WHO, 2014). Aiswarya et al. (2011) reported the use of the cashew nut shell oil on the sore of leprosy which improves the healing activity. Anacardic acid had also been reported to reduce the severity of the infection (Laurens, 1982).

Sore throat

A sore throat is a pain anywhere in the throat, often the pain is as a result of *Streptococcus* sp. infection (Marx, 2010). Franca (1993) reported that the apple of cashew and the stem extract are used in the treatment of sore throat. The apple contains vitamin C which may have improved the immunity against the causative agent (Ramiakajato et al., 2001). The active component of the anacardic acid from cashew is the side chain with three unsaturated bonds which inhibit the enzymatic activity of the DNA gyrase during DNA replication (Kubo et al., 1994).

Syphilis

Syphilis is a sexually transmitted infection caused by the spirochete bacterium *Treponema pallidum.* The primary stage classically presents with a painless non-itchy skin ulceration (Coffin et al., 2010). Cashew stem extract can be used to treat syphilis (Akinpelu, 2001; Bassey et al., 2012). Ajibesin et al. (2011) reported that flavonoids and tannin are responsible for the antimicrobial activity of cashew stem against syphilis. Their activity is probably due to their ability to complex with extracellular and soluble proteins and to complex with bacterial cell walls, more lipophilic flavonoids may also disrupt microbial membranes (Aiswarya et al., 2011).

Tonsillitis

Tonsillitis is a painful infection of the tonsils (the tissue masses located on either side of the throat), that can be caused by a virus or bacterium. When bacteria are responsible for the infection, *Streptococcus* sp. is often the cause (Delmar et al., 2006). The cashew apple has been reported to be useful in the treatment of tonsillitis (Franca, 1993). This may be due to the high content of vitamin C (Behrens, 1996) in cashew, because vitamins have been reported to increase human immunity through increased activity of the functions of phagocytes, proliferation of T lymphocytes, production of interferon and gene expression of monocyte adhesion molecules (Leibovitz et al., 1981).

Dental infection

The oral cavity contains several microenvironments that can be colonized by bacteria and consequently support the formation of biofilms. Biofilms are involved in the etiology of the most common diseases of the oral cavity, such as dental caries and periodontal disease (Martins et al., 2012). *Streptococcus mutans* is commonly found in the human oral cavity and contributes significantly to tooth decay (Biswas et al., 2010). As reported by Khare (2007) the bark of cashew had been used in the treatment of toothache due to the presence of flavonoids which disrupt the microbial membranes of *S. mutans.* An extract from cashew peduncle bagasse also showed bacteriostatic and bactericidal activity on *S. mutans*, and eventually inhibited biofilm formation (Furtado et al., 2014). The bagasse from cashew peduncle is an industrial residue remaining after juice extraction, and its

Table 1. Parts of cashew used in the treatment of infectious diseases and discomforts.

Disease	Cashew part	References
Bacterial		
Leprosy	Shell oil	Aiswarya et al. (2011).
Sore throat	Apple, Stem	Franca (1993)
Syphilis	Stem	Akinpelu (2001); Bassy et al. (2012).
Tonsillitis	Apple	Franca (1993)
Toothache	Leaf, Bark	Khare (2007); Varghese et al. (2013).
Urinary disorder	Apple, Bark	Aiswarya et al. (2011); Arekemase et al. (2011).
Venereal disease	Leaf, Bark	Akash et al. (2009).
Fungal		
Skin disease (Dermatomycosis)	Bark, Leaf	Franca (1993); Anke et al. (2003).
Thrush	Leaf	Akash et al. (2009).
Helminthics		
Worms	Apple	Niezen et al. (1995)
Protozoal		
Leishmaniasis and Trypanosomiasis	Bark	Franca (1993); Bassy et al. (2012)
Malaria	Bark, Leaf	Obembe et al. (2012); Kunle et al. (2013).
Viral		
Warts	Shell oil	Agedah et al. (2010)

use is rather limited (Broinizi et al., 2007).

Based on the prevalence of pathogens observed in periodontitis patients, it was observed that *Porphyromonas gingivalis* and *Prevotella intermedia* were frequently recovered in patients showing angular pattern of bone loss. The presence of bioactive ingredients in the cashew leaves like carbohydrates, tannins, saponins, resins, alkaloids and flavanoids add to their antimicrobial activities. A phytochemical screening analysis on *Anacardium occidentale* leaves has showed the presence of high concentration of tannins in the aqueous extract of the leaf (Abulude et al., 2010). This could probably account for the effective action of aqueous form compared to the methanolic extract in the inhibitory activity against *P. gingivalis* and *P. intermedia* (Varghese et al., 2013).

Urinary disorder (infection)

Escherichia coli is the most common etiological agent of urinary infections; however, *Klebsiella* spp., *Staphylococcus* spp. and *Pseudomonas aeruginosa* are often isolated in cases of urinary infections (Safar et al., 2008). Aderiye and David (2014) reported that the water extract of cashew apple peel extract on *Methicillin-resistant Staphylococcus aureus* showed an inhibitory effect on the growth of the organism. Aiswarya et al. (2011) reported that the antimicrobial activity of the cashew apple extracted with water and alcohol had an inhibitory effect of 22 and 28 mm zone of inhibition against *Klebsiella pneumoniae* respectively. Furthermore, the aqueous extract showed MIC of 0.09 mg/ml and ethanolic extract 0.08 mg/ml. Phytochemical analyses of the crude extracts of the cashew apple revealed the presence of flavonoids, tannins, triterpenoids and phenolics, these components are responsible for the anti-microbial activity of the extracts (Aiswarya et al., 2011).

Primary screening of ethanolic and aqueous extracts of *Anacardium occidentale* (bark) for antimicrobial activity against *Escherichia coli, Pseudomonas aeruginosa, Shigella dysenteriae, Salmonella* typhi and *Staphylococcus aureus* showed that the ethanolic extract was more effective than the aqueous extract (Arekemase et al., 2011). Since the extract of the apple and the stem of cashew have inhibitory effect on the causative agent of urinary infection, it is evident that the extract will be useful in treating the infection.

Venereal disease

These are infections that are commonly spread by sex, especially in vaginal intercourse, anal sex and oral sex (Patrick et al., 2013). Microorganisms involved include bacteria and viruses. Akash et al. (2009) reported that the

leaf and bark of cashew are useful in the treatment, since extract of cashew had been reported for their antimicrobial activities.

Anti-fungal activity

Skin disease and dermatomycosis

Skin diseases are diseases associated with the skin. Dermatomycosis is a skin disease caused by fungi; the causative organisms in most cases include species of Candida, *Trichophyton* and *Cryptococcus* (Anke et al., 2003). These organisms had been reported to be killed or inhibited by the extract of cashew bark and leaf (Akinpelu, 2001). The antifungal activity of both the bark and leaf is due to the bioactive components such as triterpenoids, phenolic and volatile oils reported by Ifesan et al. (2013) to be active against fungal isolates. These phenolic compounds have been shown to be toxic to microorganisms based on the site(s) and number of hydroxyl groups on the phenol group with evidence that increased hydroxylation results in increased toxicity (Geissman, 1963). The mechanisms thought to be responsible for phenolic toxicity to microorganisms include enzyme inhibition by the oxidized compounds, possibly through reaction with sulfhydryl groups or through more non-specific interactions with the proteins (Aiswarya et al., 2011).

Thrush

There are several reports on antifungal potential possessed by plant extracts and phytochemicals (Pandey et al., 1982; Singh and Upadyay, 1991; Wilson et al., 1997; Bindu et al., 1998). Thrush is a disease caused by *Candida albicans,* in the mouth or in the vagina. Akash et al. (2009) reported the antifungal effect of cashew leaf extract on two fungi where the minimum inhibiting concentrations (MICs) for ethanolic and petroleum ether extracts were found to be 15.62 and 31.25 µg/ml respectively for *C. albicans*. It was also observed that the zone of inhibition of the ethanolic extract was higher with 17 mm while the petroleum ether extract was 13 mm in diameter. Anke et al. (2003) reported that the triterpenoids are responsible for the antimicrobial activity against *C. albicans.* Triterpenoids disrupt the cytoplasmic membrane of this organism which is often indicated by the leakage of intracellular constituents (Lambert and Hammond, 1973).

Anti-helminthics

The false fruit extract of *Anacardium occidentale* not only demonstrated paralysis, but also caused the death of worms (*Ascaridia galli*). Phytochemical analyses of the crude extracts revealed the presence of tannins as one of the chemical constituents. Tannins were shown to produce anti-helminthic activities (Niezen et al., 1995). Tannin was shown to interfere with energy generation in helminth parasites by uncoupling parasite specific fumarate reductase mediated oxidative phosphorylation reaction. Another possible anti-helminthic effect of tannins is that they can bind to free proteins in the gastrointestinal tract of host animal (Athnasiadou et al., 2001) or glycoprotein on the cuticle of the parasite (Thompson and Geary, 1995) and cause death to it.

Anti-protozoal activity

Leishmaniasis and trypanosomiasis

The protozoan parasites such as *Trypanosoma cruzi, T. brucei* and *Leishmania* sp. are considered to be causative agents for Chaga's disease, sleeping sickness and leishmaniasis respectively. Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) is a key enzyme involved in the parasite's glycolytic pathway and plays a central role in controlling ATP production in the parasite. Therefore, GAPDH has been considered an important target for drug development against these parasites. Anacardic acid (from cashew bark) AA derivatives such as 6-n-pentadecyl- and 6-n-dodecylsalicylic acids showed potent inhibition against GAPDH with IC_{50} values of 0.028 and 0.055 mM, respectively (Mahadevappa et al., 2011). The inhibition found to be irreversible and not prevented by the addition of Triton X-100 suggests the absence of aggregate-based inhibition. In addition, detailed enzyme kinetics revealed that the AA derivatives exerted non-competitive inhibition with respect to both substrate and co-factor (Pereira et al., 2008; Mahadevappa et al., 2011).

Malaria

Anacardium occidentale leaves and bark had been reported for its amebicidal, antioxidant and astringent properties. The extracts are used to treat malaria (Razalia et al., 2008; Orwa et al., 2009). As reported by Obembe et al. (2012) and Kunle et al. (2013) cashew had been used extensively in the treatment of malaria. The tannin that is present in both the leaf and stem extracts of cashew was said to be responsible for the antimicrobial activity against *Plasmodium* spp. which is the causative organism of malaria, however, the mechanism of action is not yet known (Obembe et al., 2012).

Anti-viral activity

Warts

Warts are actually benign tumors of the epidermis that

Table 2. Cashew parts used in the administration of some allergies and inflammation.

Allergies/ Inflammation	Cashew part	References
Asthma	Bark	Mahadevappa et al. (2011).
Bronchitis	Leaf, bark	Franca et al. (1996).
Inflammation (edemas)	Bark, leaf	Vanderlinde et al. (2009); Pawar and Pal (2002).
Pain	Leaf, bark	Pawar and Pal (2002).

occur due to the effect of human Papilloma virus HPV. The shell oil of cashew had been reportedly used in the treatment and removal of warts. Cashew shell oil extracted from the waste of cashew shell is 100% organic. The two main ingredients of the cashew oil are anacardic acid and cardol both associated in dermatological treatment and anti-aging, however the mechanism of the action is not fully understood, but it is believed that the anacardic acid present in the oil inhibit the growth of the HPV (Winterhalter, 1991; Agedah et al., 2010).

ALLERGIES/INFLAMMATION

Some cashew parts employed in the administration of some allergies and inflammation of tissues are listed in Table 2.

Asthma

Asthma is a common chronic inflammatory disease of the airway characterized by variable and recurring symptoms, reversible airflow obstruction and bronchospasm, common symptoms include wheezing coughing, chest tightness and shortness of breath (Martinez, 2007). Mahadevappa et al. (2011) reported that the back extract of cashew can be used in reducing the inflammatory effect of the air way, this may be due to the presence of tannin found generally in the stem extract. According to Mota et al. (1985) the hydrolysable and non-hydrolysable tannins obtained from the back of cashew on injection, demonstrated apparent anti-inflammatory activity in carrageenan and dextran-induced rat paw edemas.

Bronchitis

This is an inflammation of the mucous membrane of the bronchi: the larger and medium airways that carry airflow from the trachea into the more distal part of the lung parenchyma. The symptoms might include cough and production of sputum (Lee and Dennis, 2004). Franca et al. (1996) reported that the leaf and bark extract of cashew are used in the treatment of the disease. The component of the leaf and bark that might be responsible is tannin. Tannins had been reported to inhibit acetic acid induced writhing responses in mice and were found to antagonise the permeability, increasing effects in the rats of certain mediators of inflammation and inhibit the migration of leucocytes to an inflammatory site (Mota et al., 1985).

Inflammation

Pawar and Pal (2002) reported the anti-inflammatory effect of cashew leaf extract, as shown in carrageenan induced rat paw edema. The acetone soluble part of methanolic extract showed better analgesic and anti-inflammatory activity. According to Mota et al. (1985), the hydrolysable and non-hydrolysable tannins obtained from the bark of cashew on injection of the rats, demonstrated apparent anti-inflammatory activity in carrageenan and dextran-induced rat paw edema. The tannins also inhibited acetic acid induced writhing responses in mice and were found to antagonise the permeability increasing effects in the rats of certain mediators of inflammation and inhibit the migration of leucocytes to an inflammatory site. Another possible mechanism by which the extract exhibits anti-inflammatory effect is through the inhibition of nitric oxide producing inflammatory cells (Olajide et al., 2004).

Pain

Analgesic activity of *Anacardium occidentale* leaf was compared by tail flick test. The pentazocine showed 67.47% of analgesia, while petroleum ether, chloroform and acetone soluble part of methanolic extracts of the cashew leaf showed 46.48, 33.17 and 53.80% of analgesia respectively ($P < 0.05$). Acetone soluble part of petroleum ether extract of *A. occidentale* exhibited significant analgesic activity. In the control group, the tail flick latency was 2.79 ± 0.23 s, while in pentazocine, petroleum ether, chloroform and acetone soluble part of methanolic extracts of *A. occidentale* showed tail flick latency increased to 10.5 ± 0.32, 8.5 ± 0.25, 8.0 ± 0.25 and 11.25 ± 0.43 s, respectively ($P < 0.05$). This result indicated that the extract of cashew can be used as analgesic (Pawar and Pal, 2002). The compounds present in the extract of cashew bark and stem which are suspected to be flavonoids probably inhibit the cyclo-

Table 3. Use of cashew in the treatment of GIT syndromes.

Diseases	Cashew part	References
Diarrhea	Leaf, bark	Kudi et al. (1999); Arekemase et al. (2011).
Dysentery	Fruit, bark, leaf	Leslie (2005); Aiswarya et al. (2011).
Dyspepsia	Leaf	Franca et al. (1996)
Nausea	Leaf	Li et al. (1999)
Ulcers	Leaf, bark	Akinpelu (2001).

oxygenase and/or the lipoxygenase pathways of arachidonate metabolism, blocking the leukotriene mechanism, which is important to chemotaxis, and/or also blocking prostaglandin mechanism, which is important to the genesis of the edema and pain (Morrow and Roberts II, 2001).

GASTROINTESTINAL TRACT (GIT) SYNDROMES

Some gastrointestinal tract syndromes have also been reported to be treated using some cashew parts extracts (Table 3).

Diarrhoea

The most common bacteria that are incriminated in gastrointestinal tract infection are; *Salmonella*, *Campylobacter*, *Shigella*, *Vibrio cholera*, *Vibrio parahaemoliticus*, *Clostridium perfiringens*, *Bacillus cereus*, *Yersinia enterocolitica* and *Escherichia coli*. Diarrhoea is the most common outcome of gastrointestinal tract infection. It is an abnormal faecal discharge characterized by frequent and/ or fluid stool, usually resulting from disease of the small intestine and involving increased fluid and electrolyte loss (WHO and ISH, 2003). Kudi et al. (1999) and Arekemase et al. (2011) reported the antimicrobial effect of ethanolic and aqueous extracts of *A. occidentale* bark and leaf on some bacteria that can cause gastrointestinal infections.

The bark and leaves of cashew are a rich source of tannins, a group of plant chemicals with documented medicinal activity. These tannins have demonstrated anti-inflammatory and astringent effects, which may be why cashew is effective in treating diarrhoea (Abdul Gaffar et al., 2008). Banso and Adeyemo (2007) had earlier reported that tannins isolated from the medicinal plant possessed remarkable toxic activity against bacteria and fungi and may assume pharmacological importance in future. The relative antimicrobial action of tannins can be related to their ability to inactivate microbial adhesins, enzymes and cell envelope transport proteins. They also complex with polysaccharides (Ya et al., 1988). Tannins cause contraction of the surface with which they come in contact and reduce permeability. When consumed, they reduce the permeability of the intestinal lining of the intestine, which reduces the amount of toxins from the microorganisms assimilated into the blood. This reduces the harmful effects the toxins may have, as well as the body's reaction to the diarrhoea and dehydration (Oyesanmi and Ajao, 2011).

Dysentery

Dysentery is an inflammation disorder of the gastrointestinal tract often associated with blood and pus in the faeces and accompanied by symptoms of pain, fever, abdominal cramps, usually resulting from disease of the large intestine; the most common bacterium often incriminated is *Shigella* (WHO, 1997). Arekemase et al. (2011) reported the antimicrobial effect of ethanolic and aqueous extracts of *A. occidentale* bark and leaf on some bacteria including *Shigella dysenteriae*. The antimicrobial activity of the extracts were attributed to flavonoids, which are also hydroxylated phenolic substances but occur as a C6-C3 unit linked to an aromatic ring. Their activity is probably due to their ability to complex with extracellular and soluble proteins and to complex with bacterial cell walls; more lipophilic flavonoids may also disrupt microbial membranes (Aiswarya et al., 2011).

Dyspepsia

This is a condition of impaired digestion. It is a medical condition characterized by chronic or recurrent pain in the upper abdomen, upper abdominal fullness and feeling full earlier than expected when eating (Talley and Vakel, 2005). Franca et al. (1996) reported that the leaf of cashew can be used in treatment of dyspepsia. The ability of the cashew leaf had also been attributed to the presence of flavonoids found in the leaf of cashew (Jellin et al., 2002).

Nausea

Nausea is a sensation of unease and discomfort in the upper stomach with an involuntary urge to vomit. It occasionally precedes vomiting (Metz and Hebbord, 2007). Li et al. (1999) reported that the leaf extract of cashew can be used in treating nausea. Anacardic acid

and tannins may have been responsible. Tannins cause contraction of the stomach surface with which they come in contact and reduce permeability. When consumed, they reduce the permeability of the intestinal lining of the intestine, and thereby relieve the discomfort (Oyesanmi and Ajao, 2011).

Ulcer

Ulcer is a discontinuity or break in a body membrane that impedes the organ of which that membrane is part of from continuing its normal function (Cullen et al., 1997). The anti-ulcerogenic effect of a hydroethanolic extract of *A. occidentale* leaves had been investigated. The extract was found to have inhibited gastric lesions induced by HCl/ethanol in female rats. A dose-response effect study showed that the ED_{50} was 150 mg/kg b.w. Extract doses higher than 100 mg/kg b.w. were more effective than 30 mg/kg of lansoprazol in inhibiting gastric lesions. A methanolic fraction (257.12 mg/kg) which reduced gastric lesion at 88.20% is likely to contain the active principle of the antiulcer effect (Konan, 2007a,b).

Extracts of *A. occidentale* leaf has inhibitory effect on *Helicobacter pylori,* the infectious agent incriminated in the pathogenesis of gastric ulcer (Kubo and Lee, 1999). *H. pylori* peptic ulcers are treated with drugs that kill the bacteria, reduce stomach acid, and protect the stomach lining (Anonymous, 2004). Treatment usually involves a combination of antibiotics, acid suppressors and stomach protectors (Anonymous, 2004). The gastroprotection effect of anacardic acids against the ethanol-induced gastric damage was studied to examine the underlying mechanism(s). Gastroprotection was assessed in relation to inhibition of gastric lesion area. These results suggest that anacardic acids afford gastroprotection principally through an antioxidant mechanism, activation of capsaicin-sensitive gastric afferents, stimulation of endogenous prostaglandins and nitric oxide and opening of K^+ ATP channels (Talita, 2010).

ENDOCRINE

Endocrine system refers to the collection of glands of an organism that secrete hormones directly into the circulatory system to be carried towards a distance target organ. Here, we are considering the effect of cashew on some endocrine organs, the pancreas as in the case of diabetes; testis in the issue of impotence and kidney with respect to urinary insufficiency.

Diabetes

Diabetes mellitus is a syndrome characterized by disordered metabolism and inappropriately high blood sugar (hyperglycaemia) resulting from either low level or resistance to insulin (Guyton and Hall, 2002). Insulin is produced by the beta cells of the endocrine part of the pancreas. These cells are sensitive to cytotoxic action of streptozotocin which induces experimental diabetes mellitus in animals (Ganda, 1976).

Bassey et al. (2012) reported the effect of ethanolic stem extract of *A*. *occidentale* on the pancreas of diabetes induced Wistar Rat. The pancreas produces insulin from its beta cell; this hormone is a principal hormone that regulates uptake of glucose from the blood. Therefore, deficiency of insulin or the insensitivity of its receptor plays a central role in all forms of diabetes mellitus. In the research work, streptozotocin was used to selectively destroy beta cells. The synergistic action of nitric oxide and reactive radicals generated are responsible for necrotic changes seen in beta cells. The increase in beta cell population in the treated groups shows the regenerative role of *A*. *occidentale* bark extract, the regeneration may be attributed to the presence of tannins (Mota, 1985), anacardic acid, phenol and flavonoids, alkanoids, saponins present in the extract as they have been documented to have antioxidant effects (Olaleye et al., 2007). The extract also contains amino acids which may have contributed to the formation of polypeptide growth factors needed for differentiation of beta stem cells in the pancreas. This may have led to the regeneration process. From results obtained, it can be concluded that the regenerative effect of *A. occidentale* extract on beta cells may be due to the phytochemical components of the bark extract of the *A. occidentale* (Bassey et al., 2012; Egwim and Oloyede, 2011).

Insulin synthesized by beta cells of the pancreas is the principal hormone that regulates uptake of glucose from the blood. Therefore, the deficiency of insulin or the insensitivity of its receptor or a combination thereof has been implicated in all forms of dysglycaemia (Egwim and Oloyede, 2011). The increase in beta cell population in the experimental animal models indicates a regenerative role of natural anti-diabetic “candidates” such as *A. occidentale* leaves, seeds and stem bark extracts. Beta cells regeneration may be attributed to the presence of tannins, anacardic acid, phenol, flavonoids, alkaloids and saponins present in the extracts have been documented to have antioxidant effects. The herb also contains amino acids which may have contributed to the formation of the Beta cells (Omojate et al., 2014).

The crude ethanolic extract of cashew root showed hypoglycemic potencies in both guinea pigs and rats. The cashew root extract contained some natural substances that can be harnessed for the treatment and management of diabetes mellitus (Egwim, 2005).

Impotence

This is a sexual dysfunction characterized by the inability

to develop or maintain an erection of the penis during sexual activity (Montague et al., 2005). Both Franca et al. (1996) and Bassy et al. (2012) reported that the leaf and the bark of cashew are used in correcting sexual dysfunction. Although the mechanism of action is unclear, however, triterpenoid which is one of the components of both cashew leaf and stem extracts has been reportedly used in aphrodisiac studies. Animal studies have indicated its stimulatory effects on pituitary and antagonizing effects on various vaso-constricting agents such as noradrenaline, acetylcholine, prostaglandin and oxytocin, which ultimately increases libido by altering related hormones and increasing blood flow by relaxing smooth muscles of corpus cavernosum (Singh and Singh, 2012).

Urinary insufficiency

This is a medical condition in which the kidneys fail to adequately filter waste products from the blood (Medicine plus, 2012). Omotoso et al. (2012) found that the ethanolic extract of *Anacardium occidentale* (EAO) had a cleansing effect on the kidney. It was observed that both the urine creatinine concentration and the renal clearance showed reasonable trends, with higher values seen in the high dose group. Since all other sources of variations were properly controlled and the renal creatinine was found to be significantly (and in a dose dependent manner) increased by oral administration of EAO, it was concluded that oral administration of EAO (over a period of six weeks) increases renal clearance of creatinine in Sprague Dawley rats. However, this simple study is unable to confirm/suggest the possible mechanisms by which EAO increases renal creatinine clearance in Sprague Dawley rats (Omotoso et al., 2012).

EFFECT OF CASHEW ON CARDIOVASCULAR ACTIVITY

Flavonoid and phenolic compounds have widely been reported as antioxidant agents positively correlated in the treatment of cardiovascular diseases due to their anti-hypertensive properties (Akhlaghi and Bandy, 2009; Xu et al., 2011). Cashew leaf extract was found to contain high amounts of flavonoid and phenolic compounds which exhibited anti-hypertensive activity (Cienfuegos-Jovellanos et al., 2009). In addition, crude extract containing flavonoids, sterols and tannins markedly decreased the arterial blood pressure of anaesthetized rats. The extract also inhibited the force and rate of atrial contractions in isolated guinea-pig atria, and relaxed the phenylephrine and K^+-induced contractions in the Ca^{2+}-free medium (Khan and Gilani, 2008). Several mechanisms that may contribute to their anti-hypertension properties include the inhibition of phosphodiesterase, reduction of intracelluler Ca^{2+}, induction of nitric oxide (NO) in smooth muscles (Akhlaghi and Bandy, 2009; Torres-Piedra et al., 2011). Among them, NO induction from vascular endothelium resulting from anti-oxidative activity of flavonoid and phenolic compounds has an important contribution in their anti-hypertension properties.

Oxidative stress is still an attractive target for cardiovascular prevention and therapy. The fact is related to the abnormal production of reactive oxygen species (ROS) resulting in decrease in vascular bioavailability of NO that contributes to the pathogenesis of the endothelial dysfunction in the development of hypertension disease (Munzel et al., 2010; Cohen and Tong, 2010). In the production of ROS, many vascular enzymes are involved such as NADPH oxidases, xanthine oxidase and uncoupled endothelial nitric oxide synthase. Compounds that are potent inhibitors for oxidative stress are considered to be used in hypertension therapy due to its vascular function preservation activity (Weseler and Bast, 2010).

EFFECT OF CASHEW ON RESPIRATORY ACTIVITY

The effects of different cashew parts on the respiratory disorder are considered. This may involve the use of cashew in the treatment and management of common cold, nasal congestion, cough and flu.

Cold

A viral infectious disease of the upper respiratory tract caused by common cold virus, may affect the nose and produce some disturbing symptoms which include coughing, sore throat sneezing and fever that usually get resolved in seven to ten days (John, 2008). Mahadevappa et al. (2011) reported that the extract of cashew bark can effectively be used in the treatment of such cold.

Congestion

Nasal congestion is the blockage of the nasal passages usually due to membranes lining the nose becoming swollen from inflamed blood vessels (Bergeson and Shaw, 2001). The ability of the extract of cashew bark to reduce congestion may have been from the ability of tannin to reduce the inflamed blood vessels by inhibiting the migration of leucocytes to an inflammatory site (Mahadevappa et al., 2011).

Cough

This is a sudden and often repetitive occurring reflex which helps to clear the large breathing passages from

secretions, irritation, foreign particles and microbes (Chung and Pavord, 2008). Franca et al. (1996) reported that the bark and leaf of cashew are used to treat cough. Cashew syrup is a good remedy for coughs and colds (Winterhalter, 1991).

Flu

This is an infectious disease caused by the influenza virus and symptoms can be mild to severe. The most common symptoms include a high fever, running nose, sore throat, muscle pain, headache, coughing and feeling tired (Duben et al., 2011). Duke (1983) reported that the apple of cashew is used in treating flu. This might be as a result of the vitamin C present in the apple which improves the immune system especially against viral infection (Ramiakajato et al., 2001).

EFFECT OF CASHEW ON CANCEROUS CELLS AND TUMOR

The cytotoxic effect of cashew on cells that divide uncontrollably are considered. This involves the effect on cancerous cells and tumor.

Cancer

Cancer, also known as malignant tumor or malignant neoplasm results from abnormal cell growth with the potential to invade or spread to other parts of the body (WHO CFS, 2014). In a research carried out on the stem of the cashew by Gustavo et al. (2009), all the concentrations of cashew stem bark methanolic extract (CSBME) in simultaneous treatments with doxorubicin (DXR) during continuous treatment presented anti-mutagenic effect, since the mean chromosome aberration (CA) frequencies were statistically different from those obtained in the positive-control group (DXR) and the concentration of 500 µg/ml reduced the damage to levels similar to the negative control. It was observed that lower CSBME concentrations are recommended for its use, since the lowest dose presented a larger reduction in the mean CA frequency and none of the concentrations evaluated showed mutagenic activity. Therefore, it was concluded that the cashew stem bark methanolic extract could be useful in the prevention of damage against innumerous compounds with mutagenic potential, which present the same action mechanism as DXR.

Nzi et al. (2012) reported that agathisflavone was shown to be cytotoxic against two malignant blood cell lines – Jurkat and HL60. A likely mechanism of action of agathisflavone would be by inhibition of cyclic nucleotide phosphodiesterases (PDEs) (Harborne, 1986; Chaabi et al., 2007). PDEs are hydrolytic enzymes that have important role in regulating cAMP cellular levels by cleaving cAMP at the 3-phosphodiester bond, yielding inactive 5-adenosine monophosphate (Asirvatham et al., 2004). Nzi et al. (2012) concluded that the cashew leaves contain the biflavonoid agathisflavone. It causes lymphopenia *in vivo* and selectively inhibits growth of leukemia cells by inducing apoptosis in these cells. The cashew ethanolic extract displayed low toxicity in rats, suggesting that its active compound agathisflavone might potentially be used in therapy.

Tumour

Tumour is an abnormal growth of tissue, the abnormal growth usually but not always forms a mass (Cooper, 1992). The medicinal properties of phytochemicals present in cashew nut have cytotoxic activity against several tumour cell lines (Kubo et al., 1994). Nzi et al. (2012) reported the cytotoxic effect of ethanolic cashew extract on rats. The crude ethanolic extract elicited a significant reduction in the level of rat lymphocytes and reduced the proliferation of Jurkat lymphocytes *in vitro*. Agathisflavone, one of the purified components of the ethanolic extract of cashew leaves, was significantly more cytotoxic than the others with an IC_{50} of 2.05 µg/ml (4.45 µM). Vinblastine and doxorubicin used as positive controls, presented IC_{50} values of 0.455 and 0.39 µg/ml, respectively.

EFFECT OF CASHEW ON OTHER MINOR AILMENTS

Scurvy

Scurvy is a disease resulting from a deficiency of Vitamin C which is required for the synthesis of collagen in humans. Scurvy often presents itself initially as symptoms of malaise and lethargy, followed by formation of spots on the skin, spongy gums and bleeding from the mucous membranes. Spots are most abound on the thigh and legs and a person with the ailment looks pale, feels depressed and is partially immobilized (Evans, 1983). The apple of cashew is used in treating scurvy because of the high content of Vitamin C that is present in it (Winterhalter, 1991; Behren, 1996).

Wounds

A wound is a type of injury which happens relatively quickly in which skin is torn, cut or punctured (an open wound) or where blunt force trauma causes a contusion (a closed wound). Agedah et al. (2012) reported that the leaf of cashew is used in the treatment of wounds; the ability of the leaf to be used is based on the presence of tannin. Tannins not only heal burns and stop bleeding,

but they also stop infection while they continue to heal the wound internally. The ability of tannins to form a protective layer over the exposed tissue keeps the wound from being infected even more (Ashok and Upadhyaya, 2012).

CONCLUSION

Cashew (*Anacardium occidentale*), a resilient and fast growing evergreen tree is known for its medicinal usage which can be grouped into anti-microbial, allergies/inflammations gastrointestinal tract, endocrine, cardiovascular, respiratory, cancerous and tumor. The antimicrobial properties of cashew revealed that extracts of cashew showed great anti-microbial effect on some bacteria cell which makes it effective in the treatment of some bacterial infections like syphilis, tonsillitis, dental infection, urinary disorder (infection) and venereal diseases. This anti-bacterial activities had been attributed to the presence of some phytochemical like tannin, flavonoid and anacardic acids which inhibit a specific mechanism of growth in the bacteria incriminated in such infections. The effect of cashew extracts on fungal infections had been documented, being used in the treatment of skin disease caused by *Candida, Trichophyton* and *Cryptococcus* also in the treatment of thrush caused by C*andida albicans*. The antifungi activity has been attributed to the presence of phenolic compounds and triterpenoids present in extracts of cashew. The anti-microbial activity also includes cashew's effect as anti-helminthics, where *Ascaridia galli* are found to be killed by the extract, the anti-protozoan activity of cashew involved the use of cashew extract in treating infections of Trypanosome, Leishmania and Malaria. The anti-protozoan activity is due to the presence of tannin and anacardic acid. The antiviral activity of cashew extract was documented in the case of warts as anacardic acid in cashew oil extract inhibits the growth of the causative virus.

Allergies and inflammations can also be managed by the use of some cashew extract; the presence of tannin reduces inflammation, while the presence of flavonoid reduces pain by blocking leukotriene mechanism thereby made the extracts to be useful in the management of asthma, bronchitis, pain and edema. The gastrointestinal tract syndromes which are caused by bacteria such as diarrhoea, dysentery and ulcer are resolved, based on the anti-microbial activity of cashew extracts. Dyspepsia and nausea are managed by extract of cashew because of the presence of flavonoid, anacardic acid and tannin. The endocrine diseases are also being treated by cashew extracts, in the case of diabetes mellitus, the presence of saponin, flavonoids, alkaloids, phenols, anacardic acid and tannin had been reported to increase the regeneration rate of the beta cells. The cardiovascular system is not left out in the administration of cashew extracts, the antioxidant effect of flavonoid and phenolic compounds restore the heart back to normal. The respiratory tract also enjoys the effect of cashew extracts by treating cold, congestion, cough and flu. Cancerous cells and tumor are treated by the extracts of cashew due to the presence of agathisflavone that inhibit some cancerous and tumor cells. Because of the nutritional quality of the cashew fruit, especially the vitamin C, it is often used in the treatment of scurvy and other minor ailments.

The properties embedded in cashew ranging from antimicrobial effect to nutritional values made cashew a tree of great importance which should be preserved and seen as a potential medicinal plant that should be exploited. The phytochemicals present in cashew may serve as source of new and effective drugs.

REFERENCES

Abdul Gaffar R, Sazalii NES, Abdul Majid FA, **2008**. Colour reduction and anti-microbial evaluation of pretreated cashew leaves extract. J Chem Nat Res Eng, *Special Edition: 1-9.*

Abulude FO, Ogunkoya MO, Akinjagunla YS, **2010**. Phytochemical screening of leaves and stem of Cashew tree (*Anacardium occidentate*). Environ Agric Food Chem, 9:815-819.

Aderiye BI, **David** OM, **2014**. *In vitro* antibacterial activity of aqueous extracts of cashew (*Anacardium occidentale* L.) fruit peels using bioautography method. Eur J Med Plant, 4(3):284-291.

Agedah CE, Bawo DDS, Nyananyo BL, **2010**. Identification of antimicrobial properties of cashew, *Anacardium occidentale* L. (Family Anacardiaceae). J Appl Sci Environ Manag, 14(3):25–27.

Aiswarya G, Reza KH, Radhika G, Mohamed F, **2011**. Study for antibacterial activity of cashew apple (*Anacardium occidentale*) extracts. Schol Res Lib, 3(1):193-200.

Ajibesin KK, Bala DN, Umoh UF, **2011**. The use of medicinal plants to treat sexually transmitted disease in Nigeria: Ethnomedical survey of Niger Delta region. Int J Green Pharm, 3(5):181-191.

Akash P, Dahake P, Vishal D, Joshi A, Joshi B, **2009**. Antimicrobial screening of different extract of *Anacardium occidentale* Linn. Leaves. Int J Chem Tech Res, 1(4):856–858.

Akhlaghi M, **Bandy** B, **2009**. Mechanisms of flavonoid protection against myocardial ischemia-reperfusion injury. J Mol Cell Cardiol, 46:309-317.

Akinpelu DA, **2001**. Antimicrobial activity of *Anacardium occidentale* bark. Filoterapia, 72(3):286-287.

Anke T, Werle A, Kappe R, Sterner O, **2003**. A new antifungal antibiotic from a *Favolaschia* species (Basidiomycetes). Intersci Conf Antimicrob Agents Chemother Intersci Conf Antimicro Agents Chemother. 43: Abs No. F-1235, IBWF, Kaiserslautern, Germany.

Anonymous, **2004**. *H. pylori* and peptic ulcer. National Digestive Disease information Clearing House (NDDIC). NIH Publication No. 05-4225.

Arekemase MO, Oyeyiola GP, Aliyu MB, **2011**. Antibacterial activity of *Anacaridum occidentale* on some enterotoxin producing bacteria. Int J Biol, 3(4):968-973.

Ashok PK, **Upadhyaya** K, **2012**. Tannins are astringent. J Pharmacog Phytochem, 1(3):45-50.

Asirvatham AL, Galligan SG, Schillace RV, Davey MP, Vasta V, Beavo JA, **2004**. A-kinase anchoring proteins interact with phosphodiesterases in T lymphocyte cell lines. J Immunol. 173(8):4806–4814.

Athnasiadou S, Kyriazakis I, Jackson F, Coop RL, **2001**. Direct anthelmintic effects of condensed tannins towards different gastrointestinal nematodes of sheep: *In vitro* and *in vivo* studies. Vet Parasitol, 99:205–219.

Banso A, **Adeyemo** SO, **2007**. Evaluation of antimicrobial properties of

tannins isolated from *Dichrostachys cinerea*. Afr J Biotech, 6(15):1785-1787.
Bassey T, Eliakim-Ikechukwu C, Ihentuge C, **2012**. Effect of ethanolic stem-bark extract of *Anacardium occidentale* (cashew) on the histology of the pancreas of diabetic Wistar rats. J Biol Agric Healthcare, 2(11):153-159.
Behrens R, **1996**. Cashew as an agroforestry crop: Prospects and potentials. Trop Agric, 9: 83.
Bergeson PS, Shaw JC, 2001. Are infants really obligatory nasal breather? Clin Pediat, 40(10):567-569.
Bindu TK, Shafi PM, Rajan PP, Sarma VR, **1998**. Antifungal activity of *Uvaria narum* extracts. Allelopathy J, 5:67-76.
Biswas S, Bowler ICJW, Bunch C, Prendergast B, Webster DP, **2010**. *Streptococcus mutans* infective endocarditis complicated by vertebral discitis following dental treatment without antibiotic prophylaxis. J Med Microbial, 59:1257-1259.
Broinizi PRB, Andrade-wartha ERS, Silva AMO, Novoa AJV, Torres RP, Azeredo HMC, Alves RE, Mancini-Filho J, **2007**. Evaluation of the antioxidant activity of phenolic compounds naturally contained in by-products of the cashew apple (*Anacardium occidentale* L.). Ciênc Tecnol Aliment, 27(4):902- 908.
Chaabi M, Antheaume C, Weniger B, Justiniano H, Lugnier C, Lobstein A, **2007**. Biflavones of *Decussocarpus rospigliosii* as phosphodiesterases inhibitors. Planta Med, 73(12):1284–1286.
Chung KF, **Pavord** ID, **2008**. Prevalence, pathogenesis and causes of chronic cough. Lancet, 371 (9621):1364-1374.
Cienfuegos-Jovellanos E, Quiñones MM, Muguerza B, Moulay L, Miguel M, Aleixandre A, **2009**. Antihypertensive effect of a polyphenol-rich cocoa powder industrially processed to preserve the original flavonoids of the cocoa beans. J Agric Food Chem, 57(14):6156-6621.
Coffin LS, Newberry A, Hagn H, Cleland CM, Desjarlasis DC, Perlman DC, **2010**. Syphilis in drug users in low and middle income countries. Int J Drug Policy, 21(1):20-27.
Cohen RA, **Tong** XY, **2010**. Vascular oxidative stress. The common link in hypertensive and diabetic vascular disease. J Cardiovascular Pharmacol, 55(4)308-316.
Cooper GM, **1992**. Elements of human cancer boston. Jones and Bartlell Publishers. P.16. ISBN 9780-0-86720-191-8.
Cullen DJ, Hawkey GM, Greenwood DC, **1997**. Peptic ulcer bleeding in the elderly: Relative roles of *Helicobacter pylori* and non-steroidal anti-inflammatory drugs. Gut, 41(4):459-462.
Delmar CB, Glasziou PP, Spinks AB, **2006**. Antibiotic for sore throat. Cochrane Database Syst Rev, 18(4) 4. CD00023.
Duben E, Paul G, Engelkirik J, **2011**. Burton's microbiology for health science. (9th ed) Philadelphia wolters Kluwer Health/ Lippincott Williams and Wilkins. P. 314.
Duke AJ, **1983**. (Updated 1992). Handbook of Energy Crops. CRC Press Inc. Boca Raton Florida. 8pp.
Egwim E, **2005**. Hypoglycaemic potencies of crude ethanolic extract of cashew root and paw paw pod in guinea pigs and rats. J Herbal Pharmacoth, 5(1):27-34.
Egwim EC, **Oloyede** OB, **2011**. Ethanolic extract of cashew restores hepatic and renal integrity in streptozotocin induced diabetic rats. J Pharm Biomed Sci, 6(1):1-5.
Evans PR, **1983**. Infantile scurvy: The centenary of Barlow's disease. Br Med J (Clin Res ed), 287 (6408):1862-1863.
Franca F, **1993**. An evaluation of the effect of a bark extract from the cashew (*Anacardium occidentale* L.) on infection by Leishmania (Viannia) braziliensis. Rev Soc Bras Med Trop, 26(3):151-155.
Franca F, Lago EL, Marsden PD, **1996**. Plants used in the treatment of leishmanial ulcers due to Leishmania (Viannia) braziliensis in an endemic area of Bahia, Brazil. Rev Soc Bras Med Trop, 29(3):229-232.
Furtado MAM, Alves FC, Martins JL, Alves de Vasconcelos M, Ramos VSC, Soares de Sousa G, Coelho da Silva AL, Farias WRL, Teixeira EH, Cavada BS, Pires dos Santos R, **2014**. Effect of cashew (*Anacardium occidentale* L.) peduncle bagasse extract on *Streptococcus mutans* and its biofilm. Braz J Biosci, 12(1):9-13.
Ganda OP, Rossi AA, Like AA, **1976**. Studies on Streptozotocin diabetes. Diabetes, 25:595-603.
Geissman TA, **1963**. Flavonoid compounds, tannins, lignins and related compounds, p. 265. *In* M. Florkin and E. H. Stotz (ed.), Pyrrole pigments, isoprenoid compounds and phenolic plant constituents, vol. 9. Elsevier, New York, N.Y.
Greencottage, **2000**. Vegetable Oils: Cashew nut *(Anacardium occidentale* Linn.). Alban Muller International. Retrieved January 21, 2001, from http://www.greencottage.Com/oils/cashew.html.
Gustavo RM, Barcelos A, Fernanda S, Mateus PM, Maria AM, Ilce MC, **2009**. Evaluation of mutagenicity and anti-mutagenicity of cashew stem bark methanolic extract *in vitro.* Exper Toxicol Pathol, 63:435–440.
Guyton AC, **Hall** JK **2002**. Textbook of Medical Physiology. 10th ed. SB Saunders Company, London.
Harborne JB, **1986**. Nature, distribution and function of plant flavonoids. Prog Clin Biol Res, 213:15–24.
Ifesan BOT, Fashakin JF, Ebosele F, Oyerinde AS, **2013**. Antioxidant and antimicrobial properties of selected plant leaves. Eur J Med Plant, 3(3):465-473.
Jellin JM, Gregory PJ, Batz F, Hitchens K, **2002**. Pharmacist's Letter/ Prescriber's Letter natural Medicines Comprehensive Database. 4th ed. Stockton, CA: Therapeutic Research Faculty; pp: 80-81.
John PR, **2008**. Textbook of oral medicine. Jayfee Brothers Publishers. P. 336.
Khan AU, **Gilani** AH, **2008**. Pharmacodynamic evaluation of *Terminalia bellerica* for its antihypertensive effect. J Food Drug Anal, 16(3):6-14.
Khare C, **2007**. Ed. Indian medicinal plants. Berlin: Springer-Verlag. 6-731.
Konan NA, **Bacchi** EM, **2007a**. Antiulcerogenic effect and acute toxicity of a hydroethanolic extract from the cashew (*Anacardium occidentale* L.) leaves. J Ethnopharmacol, 112:237-242.
Konan NA, Bacchi EM, Lincopan N, Varela SD, Varanda EA, **2007b**. Acute, subacute toxicity and genotoxic effect of a hydroethanolic extract of the cashew (*Anacardium occidentale* L.). J Ethnopharmacol, 110:30-38.
Kubo I, Kinst-Hori I, Yokokawa Y, **1994**. Tyrosinase inhibitors from *Anacardium occidentale* fruits. J Nat Prod, 57:545-551.
Kubo I, **Lee** L, **1999**. Anti-*Helicobacter pylori* agents from the cashew apple. J Agric Food Chem, 47(2):533-537.
Kudi AC, Umoh IU, Eduvie LO, Gefu I, **1999**. Screening of some Nigerian medicinal plants for antibacterial activity. J Ethnopharmacol, 67(2):225-228.
Kunle OF, Ali AA, Egharevba HO, **2013**. Medicinal plants used for the treatment of malaria in Rukuba, Bassa Local Government Area of Plateau State, Nigeria. Int J Basic Appl Sci, 2(4):134-138.
Lambert PA, **Hammond** SM, **1973**. Potassium fluxes, first indica- tions of membrane damage in micro-organisms. Biochem Biophys Res Commun, 54:796–799.
Laurens A, **1982**. Study of antimicrobial activity of *Anacardium occidentale*. L. Ann Pharm Fr. 40:143–146.
Lee G, **Dennis** A, **2004**. Cecil textbook of medicine (22nd ed). Philadelphia Penns: Saunders.
Leibovitz B, Siegel BV, 1981. Ascorbic acid and the immune response. Adv Exp Med Biol, 135:1–25.
Leslie T, **2005**. The Healing Power of Rainforest Herbs. Raintree Nutrition, Inc. Carson City.
Li C, Yoji T, Masefumi W, **1999**. Nitric oxide synthase inhibitor attenuates intestinal damage induced by zinc deficiency in rats. Nutr J, 129:792-798.
Mahadevappa H, Martin SS, Kempaiah K, Kesturu SG, **2011**. Emerging roles of anacardic acid and its derivatives:A pharmacological overview. Basic Clin Pharmacol Toxicol, 110:122–132.
Martinez FD, **2007**. Genes, environments development and asthma: a reappraisal. Eur Respirat J, 29(10):179-184.
Martins M, Monteiro DR, Oliveira R, **2012**. Biofilmes orais. In: Azevedo, N.F. & Cerca, N. (Eds.) *Biofilmes - Na Saúde, no Ambiente, na Indústria*. Porto: Tipografia Lousanense. p. 1-12.
Marx J, **2010**. Rosen's emergency medicine concepts and clinical practices 7th edition. Philadelphia, PA: mosby/Elsevier. Chapter 30.
Medicine Plus, **2012**. Kidney Failure. National Institutes of Health. http://www.nlm.nih.gov/medicineplus/kidneyfailure.html. Retrieved 1 January 2013.
Metz A, **Hebbord** G, **2007**. Nausea and vomiting in adults - 'a diagnostic approach'. Aust Fam Phys, 36(9):688-692.

Montague DK, Jarow JP, Broderick GA, Omochowski RR, Heaton JP, Lue TF, Milbank AJ, Nehra A, Shorhip ID, **2005**. Chapter: 'the management of erectile dysfunction an AUA update'. J Urol, 174(1): 230-239.

Morrow JD, **Roberts** II LJ, **2001**. Lipid-derived autacoids: Eicosanoids and Platelet-Activating Factor. In: Harman J. G.; Limbird L. E. (Eds.). Goodman & Gilman's, The Pharmacological basis of therapeutics. 10. ed. New York: McGraw Hill, p.669-685.

Mota ML, **1985**. Anti-inflammatory actions of tannins isolated from the bark of *Anacardium occidentale* L. J Ethnopharmacol, 13(3):289-300.

Munzel T, Gori T, Bruno RM, Taddei S, **2010**. Is oxidative stress a therapeutic target in cardiovascular disease? Eur Heart J, 31(22):2741-2748.

Murthy BGK, **Sivasamban** MA, **1985**. Recent trends in CNSL utilization. Cashew Research and Development: Proceedings of the International Cashew Symposium, Cochin, Kerala, India. 12-15 March 1979, pp: 201-207.

Niezen JH, Waghorn GC, Charleston WAG, Waghorn GC, **1995**. Growth and gastrointestinal nematode parasitism in lambs grazing either Lucerne (*Medicago sativa*) or sulla (*Hedysarum coronarium*), which contains condensed tannins. J Agric Sci, 125:281–289.

Nzi AK, Nilton L, Ingrit Elida CD, Jacqueline de Fátima J, Mirtes M, Tanae T, João G, Pessini A, Mendese E, Marianne B, Beny S, **2012**. Cytotoxicity of cashew flavonoids towards malignant cell lines. Exper Toxicol Pathol, 64:435– 440.

Obembe OO, Dike P, Adebiyi EF, **2012**. Ethnobotanical survey for potential anti-malarial plants in south-western Nigeria. J Ethnopharmacol, 144(3):618-626.

Olajide O, Verena MD, Angelika MV, Mutallib AA, Aduragbemi DA, Janet MM, **2004**. The effects of some Nigerian plant extracts on nitric oxide production from lipopolysaccharide-stimulated raw 264:7 macrophages. A paper presented at the international Society of Ethno biology – Ninth international congress at University of Kent, Canterbury U.K. 13th – 17th June, 2004.

Olaleye MT, Kolawole AO, Ajeje JO, **2007**. Antioxidant properties and glutathione S-Transferases inhibiting activity of *A. cordifolia* leaf extract in acetaminophen induced liver injury. Iranian J Pharm Ther, 6:63-66.

Omojasola PF, **Awe** S, **2004**. The antibacterial activity of the leaf extracts of *Anacardium occidentale* and *Gossypium hirsutun* against some selected microorganisms. Biosci Res Commun, 60(1):25-58.

Omojate CG, Felix O, Clement OA, Oghenejobo M, Akpotu M, **2014**. A review on the phytochemical and anti-hyperglycaemic properties of the fractionated *Anacardium occidentale* L. leaves, seeds and stem barks extracts. J Pharm, 4(2):27-32.

Omotoso OD, Adeeyo OA, Yusuf UA, Dare JB, Olaniyan OT, **2012**. Effects of crude ethanolic extract of *Anacardium occidentale* (cashew) stem bark on renal clearance in Sprague Dawley rats. World J Young Res, 2(3):40-43.

Orwa C, Mutua A, Kindt R, Jamnadass R, Simons A, **2009**. Agroforest tree Database: A tree reference and selection guide version 4.0 (http://www.worldagroforestry.org/af/treedb/).

Oyesomi TO, **Ajao** MS, **2011**. Histological effect of aqueous extract of *Anacardium occidentale* (cashew) stem bark on adult Wistar rat testis. Med Pract Rev, 2(7):73-77.

Pandey DK, Tripathi NN, Tripathi RD, Dixit SN, **1982**. Fungitoxic and phytotoxic properties of essential oils of *Hyptis suaveolens*. *Z.* Pflanzenkranjheiten and Pflanzenschulz, *89:344-349*.

Patrick R, Murray K, Rosenthal MA, Pfaller A, **2013**. Medical microbiology (7th ed). St Louis, Mo. Mosby. P, 418.

Pawar S, **Pal** SC, **2002**. Analgesic and anti-inflammatory activity of *Anacardium occidentale* root extracts. Hamdard-Medicus, 45(4):63-68.

Pereira JM, Severino RP, Vieira PC, Fernandes JB, Fatima M, da Silva GF, **2008**. Anacardic acid derivatives as inhibitors of glyceraldehyde-3-phosphate dehydrogenase from *Trypanosoma cruzi.* Bioorg Med Chem, 16: 8889–8895.

Rain-Tree, **1996**. Clinical references on Cajueiro *(Anacardium occidentale* L.). Tropical Plant database. Rain-tree Nutrition, Inc., Austin, Texas. Retrieved July 23, 2000, from http://www.rain-tree.com/clinillclinicca.htm#CAJUEIRO.

Rajesh K, Sumathi VS, Balasubramanian CS, Ramesh N, **2009**. Elementary chemical profiling and antifungal properties of cashew (*Anacardium occidentale* L.) nuts. Bot Res Int, 2(4):253-257.

Rakoto-Ratsimamanga A, **1968**. Elements de pharmacopee Malagasy. Notice no. 30. Bulletin de Madagascar, 18(268):741-753.

Ramiakajato V, Wet H, Ferreira DP, **2001**. Morphology of high yielding cashew *(Anacardium occidentale* L.) strains for Maputaland- South Africa. 27th annual conference of the South African Association of Botanists, Rand Afrikaans University (RAU). Johannesburg.

Razalia N, Razaba R, Junita SM, Aziz AA, **2008**. Radical scavenging and reducing properties of extracts of cashew shoots (*Anacardium occidentale*). Food Chem, 111:38–44.

Safar F, Alikgan MY, Ghotasloy R, Naghili B, Nakhlband A, **2008**. Causative agents and antimicrobial susceptabilities of urinary tract infections in the northwest of Iran. Int J Infect Dis, 13(2):140-144.

Singh AP, **Singh** R, **2012**. Potent natural aphrodisiacs for the management of erectile dysfunction and male sexual debilities. Frontiers Biosci, 1(4):167-180.

Singh G, **Upadyay** RK, **1991**. Fungitoxic activity of cumaldehyde, main constituent of *Cuminum cyminum* oil. Fitoterapia, 62: 86.

Talita CM, **2010**. Analgesic, anti-inflammatory and gastro protective effect of anacardium acidsisolated from anacardic acids isolated from anacardium occidentale in experimental models. Chem Biol Interact, 183(1):264-269.

Talley NJ, **Vakel** N, **2005**. Guildline for the management of dyspepsia. Am J Gastrenterol, 100(10):2324-2337.

Thompson DP, **Geary** TG, **1995**. The structure and function of helminth surfaces. In: Marr JJ, editor. Biochemistry and Molecular Biology of Parasites. 1st ed. New York: Academic Press; 1995. pp. 203–32.

Torres-Piedra M, Figueroa M, Hernandez-Abreu O, Ibarra-Barajas M, Navarrete-Varquez G, Estrada-Soto S, **2011**. Vasorelaxant effect of flavonoids through calmodulin inhibitor: *Ex vivo*, *in vitro*, and *in silico* approaches. Bioorg Med Chem, 19:542-546.

Vanderlinde FA, Higor FL, Elson AC, Pablinny MG, Maria AMM, Gineide CA, David do Carmo M, Wellington da Silva C, Fábio FR, **2009**. Evaluation of the antinociceptive and anti-inflammatory effects of the acetone extract from *Anacardium occidentale* L. Braz J Pharmaceut Sci, 45(3):437-442.

Varghese J, Tumkur VK, Ballal V, Bhat GS, **2013**. Antimicrobial effect of *Anacardium occidentale* leaf extract against pathogens causing periodontal disease. Adv Biosci Biotechnol, 4:15-18.

Weseler AR, **Bast** A, **2010**. Oxidative stress and vascular function: implications for pharmacologic treatments. Curr Hypertension Rep, 12(3):154-161.

Wilson CL, Solar JM, Ghaouth A, Wisniewski ME, **1997**. Rapid evaluation of plant extracts and essential oils for antifungal activity against *Botrytis cinerea*. Plant Dis, 81:204-210.

Winterhalter P, **1991**. Fruits IV. In H. Maarse (Ed.), Volatile compounds in foods and beverages (pp. 389e409). New York: Marcel Dekker.

World Health Organization and International Society of Hypertension (**WHO and ISH**) **2003**. Statement on management of hypertension. J Hypertension, 21:1983-1992.

World Health Organization (**WHO**), **1997**. Reading on Diarrhoea student manual. (WHO/CDD/SER/90, 13) Geneva.

World Health Organization (**WHO**), **2014**. Cancer Fact sheet (WHO/CFS) Geneva. Retrieved 10-6-2014.

Xu YJ, Kaur M, Dhillon RS, Tappia PS, Dhalla NS, **2011**. Health benefits of sea buckthorn for the prevention of cardiovascular diseases. J Funct Food, 3:2-12.

Ya C, Gaffney SH, Lilley TH, Haslam E, **1988**. Carbohydrate-polyphenol complexation, p. 553. *In* R. W. Hemingway, and J. J. Karchesy (ed.), Chemistry and significance of condensed tannins. Plenum Press, New York, N.Y.

Citation: Aderiye BI, David OM, Atere VA, 2015. Administration of cashew extracts in the treatment of some infections and diseases. Adv Med Plant Res, 3(3): 75-86.