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COMPARATIVE STUDIES OF THE LEVELS OF SOME PHYTOCHEMICAL CONSTITUENTS OF THE ETHANOLIC EXTRACTS OF THE LEAVES OF TWO MEDICINAL PLANTS, SENNA OCCIDENTALIS AND SENNA OBTUSIFOLIA

[1]YARGAMJI, G.I., [2]HAMIDU, S. AND [3]KAMALADDEEN, A.

[1] & [3]Department of Chemistry, Isa Kaita College of Education Dutsin-ma, Katsina State, Nigeria. [2]Department of Biology, Federal College of Education, Katsina, Katsina State, Nigeria.

ABSTRACT

Levels of some phytochemical constituents of ethanolic extracts of the leaves senna occidentalis and senna obtusifolia were determined qualitatively using standard experimental procedures. Results obtained revealed that in senna occidentalis extract, flavonoids, saponins, tannins and steroids were present at high levels; anthraquinones and alkaloids were present at medium or moderate levels while the level of carbohydrate was low. In senna obtusifolia however, tannins, steroids and alkaloids showed high levels, flavonoids had medium level while the levels of anthraquinones and carbohydrates were low and saponins were completely absent in the extract. It was concluded that the presence of these phytochemicals in these plants could be the reason for their diverse applications in

Introduction:

Plants have been used in traditional medicine and pharmacopoeia drugs from ancient times. The majority of world's population depends on plants due their medicinal value (Tagboto and Townson; Hudaib, et.al., 2008). Medicinal plants have been used for the treatment of illness since ancient period (Gajalakshmi, et,al., 2012).

According to the World Health Organization (WHO), 80% of the world populations use natural resources of plants origin in healthcare systems (Kapkoti et al., 2014; Kumar et al.,

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traditional medicine and therefore, exhaustive research was recommended to determine all the phytochemicals in them, isolate them and elucidate their structures to give room for targeting them in drug discovery and drug synthesis.

Keywords: Phytochemical, senna occidentalis, senna obtusifolia, leaves, ethanolic extracts, ethno medicine, plant

2018). As with ethno-medicine, the traditional medical systems – Ayurveda, Siddha and Unani (in India), Traditional Chinese Medicine (TMC), and biomedicine use thousands of medicines made from the secondary metabolites of different parts of plants (Alves and Rosa, 2007). Medicinal systems use more than 400 plants in traditional remedies with approximately 25% of the plants from temperate and 75% from tropical forests (Topwal and Uniyal, 2018).

Green plants synthesize and preserve a variety of phytochemical constituents, many of which are extractable and useable as raw materials for various scientific investigations. Many secondary metabolites of plants are commercially important and find use in a number of pharmaceutical applications. However, a sustained supply of the source material often becomes difficult due to factors such as environmental changes, cultural practices, diverse geographical distribution, labor cost, selection of the superior plant stock, and overexploitation by pharmaceutical industries (Singh, et.al., 2011).

Numerous plant-derived therapeutic agents for the modern medicine have been obtained from medicinal plants (Evans and Trease, 2000) most of which exhibit a variety of phytopharmaceutical properties. This has important applications in the fields of agriculture, human and veterinary medicine and plays a major role in developing novel drugs for the treatment and prevention of numerous diseases (Newman, et.al., 2003). Population growth, inadequate supply of drugs, prohibitive cost of treatments, side effects of several allopathic drugs, and development of resistance to currently used drugs for infectious diseases have led to an increased emphasis on the use of plant materials as a source of medicine for a wide variety of human ailments. Thus,

Herbs are staging a comeback, and herbal "renaissance" which is happening all over the world and so, the value of medicinal plants is increasing as some of them have proved to be as effective as synthetic medicines with fewer or no side effects and contraindications. Even the allopathic system of medicine has adopted a number of plant-derived drugs, which form an important segment of the modern pharmacopoeia. Some important chemical intermediates (e.g., diosgenin, solasodine, etc.) that are needed for manufacturing the modern drugs are also obtained from plants (Patwardhan, et.al., 2005). It has been proved that although the effects of natural remedies may seem slower, but, the results are sometimes better on the long run especially in chronic cases of diseases (Akunyili, 2003).

It is therefore very important to have sufficient knowledge regarding herbs not only because of their widespread uses, but also because they contain different phytochemicals and so have the potentials to cause toxic reactions or interfere with the actions of other drugs (Lynch and Berry, 2003).

The term Phytochemicals (from the Greek word phyto, meaning plant) refers to biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans beyond those attributed to macronutrients and micronutrients (Hasler and Blumberg, 1999). They protect plants from diseases and damages due to aggressive external factors and contribute to the plant's color, aroma and flavor. In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought, exposure to UV-light and pathogenic attacks are known as phytochemicals (Gibson, et.al., 1998; Mathai, 2000). Recently, phytochemicals have been clearly recognised to play roles in the protection of human health, when their dietary intake is significant. Based on recent development in researches, more than 4,000 phytochemicals have been cataloged (American Cancer Society, 2000) and classified by their protective function, physical characteristics and chemical characteristics (Meagher and Thomson, 1999) and about 150 0f them have been studied in detail (Moorachian, 2018).

Different classes of phytochemicals are found in fruits, vegetables, legumes, whole grains, nuts, seeds, fungi, herbs and spices (Mathai, 2000). Leafy vegetables, broccoli, cabbage, carrots, onions, garlic, whole wheat bread,

tomatoes, grapes, cherries, strawberries, raspberries, beans, legumes, and soy foods are common sources of phytochemicals (Costa, et.al., 1999). They accumulate in different parts of the plants, such as in the roots, stems, leaves, flowers, fruits or seeds (Costa, et.al., 1999). Many phytochemicals, particularly molecules responsible for the plant pigment, are often concentrated in the outer layers of the various plant tissues. Their Levels in those parts vary from plant to plant depending upon the variety, processing, cooking and growing conditions (King and Young, 1999). Phytochemicals are also today available in supplementary forms, but there is no evidence to support that they provide the same health benefits as dietary phytochemicals (American Cancer Society, 2000), such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer properties. There are more than thousand known and many unknown phytochemicals. It is well-known that plants produce these compounds to protect themselves. However, recent researches have demonstrated that many of them can also protect human against a wide range of diseases (Narasinga, 2000). Research findings suggest that some phytochemicals have the capacity to reduce the risk of coronary heart disease by preventing the oxidation of low density lipoprotein (LDL) cholesterol, reducing the synthesis or absorption of cholesterol, normalizing blood pressure and clotting, and improving arterial elasticity (Mathai, 2000). Phytochemicals can also detoxify certain substances that cause cancer by neutralizing free radicals, inhibiting enzymes that activate carcinogens, and activating the enzymes that detoxify carcinogens. For example, according to data summarized by Meagher and Thomson, genistein prevents the formation of new capillaries that are needed for tumor growth and metastasis (Meagher and Thomson, 1999). While phytochemicals are classified by their biological function, a particular compound may have more than one biological function, for instance, serving as both an antioxidant and antibacterial agent.

Although Phytochemicals are not essential nutrients and so are not required by the human body for sustaining life, but they have important properties to prevent or to fight many common diseases. Because of this property; many researches have been carried out to determine the beneficial health effects of

phytochemicals. The purpose of the present research is to determine and compare the levels of different phytochemicals present in the leaves of the two medicinal plants(Senna occidentalis and Senna obtusifolia).

Plants metabolites and ethno-medicine

Traditionally, medicinal plants have been used for the treatment of various diseases in many countries of the world, due to their availability, easy accessibility, effectiveness and affordability as well as high therapeutic value (Basalingappa, *et al*., 2018). During recent decades, different plant derived extracts and phytochemicals have been linked to a variety of potentially health-promoting biological activities. Plants such as *Hyptis suaveolans* have oil which is strongly aromatic and has been reported to be potent for reducing bacterial and fungal growth. The juice squeezed from the leaves, when mixed with lime juice is drunk to cure colic, gastrointestinal disorder and when applied on the forehead, alleviate headache (Akinloye, 2003). *Momordica balsamina* (Balsam apple) infusion is used for the treatment of stomach fever and yaws, a decoction taken internally for the same condition. It is similarly used for horses against intestinal disorder. In Europe the pounded fruit mixed with the oil is used as a dressing for imflammation, sore, swellings, yaws e.t.c. The root is sometimes used as ingredient in aphrodisiac prescriptions and along with the fruit, the seeds are also used as an abortifacient as well as a remedy for urethral discharges. Similarly, the root bark of *Anona senegalensis* (Hausa: 'Gwandar-daji') is boiled with natron for gastro-intestinal troubles. It is used in the treatment of veneral diseases, guinea worm and sores. *Boswellia dalziellii* (Hausa: 'Hano'), bark is boiled in large quantity to make bath for fever, rheumatism and gastro-intestinal troubles. *Pistia stratiotes* (Hausa: 'Kainuwa') is applied in ulcerative conditions of the mouth & tongue and also taken internally for gastro-intestinal disorders associated with worms. *Diospyros mespiliformis* (Hausa: 'Kanya'), leaves & fruit in cold infusion are used as remedy for dysentery. *Tribulus terrestris* (Hausa: 'Tsaidau'), whole plant is used as diuretic and is said to be valuable for the treatment of bladder disorders while the oil prepared from the fruit is used for rheumatism. Again, *Adasonia digitata* (Hausa: 'Kuka'), is used internally and locally applied for a variety of imflammatory conditions as a preventive agent against fever,

dysentery and genito-urinary conditions. So also, *mangifera indica* (Mango) bark and leaves with their astringent properties are used in preparing lotion and mouth-wash to treat and relieve toothache, sore gums and sore throat. An infusion of the root bark is given for diarrhoea and dysentery (Dalziel, 1958). *Vitex doniama* (Hausa: 'Dunya') is also being used by traditional medicine practitioners in the treatment of dysentery and gastroenteritis (Kilani, 2006).

The role of medicinal plants in traditional medicine practice

Traditional medicines as defined by the World Health Organization (WHO) are natural plant materials which are used without industrial processing for the treatment of diseases at a local or regional scale (Tilburt, 2008). Traditional herbal medicine has been used in developing and developed countries for thousands of years because it is natural and causes comparatively fewer complications (Wichtl, 2008). Early medical history is consistent with the history of herbal medicine. Historical evidences revealed that the first books written about medicine were the first books written about plants, including the texts of the Ebers Papyrus, written 1500 BC, in which the names of many plants have appeared (Ackerknecht, 1973). Different types of traditional drugs are widely used in Asia, Africa and Latin America to compliment basic health facilities. This use is growing rapidly in developed countries which is often referred to as complementary or alternative medicine. In the United States, the National Institutes of Health (NIH) uses the complementary and alternative medicine (CAM) to cover health systems, practices, and products but are not presently considered to be part of conventional medicine. Across the world, among all the various traditional medical systems, traditional Chinese medicine (TCM) is currently the most popular, followed by Indian medicine. In Western countries, Oriental Medicine refers to Chinese, Japanese, and Korean medicines selected by immigrants from Korea, while "Asian medicine" often includes TCM, India (Ayurveda) and Tibetan medicine. Among all treatments in traditional medicine systems, medicinal plants are most frequently used (Liu, 2011).

Contribution of medicinal plants in the discovery of conventional drugs

According to the WHO, more than 80% of the world's population today rely more on traditional medicine, mainly of plants origin, serving as the main source of health care (Farnsworth, et. al., 1985). This figure includes not only a large population of China, India and all the developing countries of the world

(Nigeria inclusive) but also many developed countries (Ganesan, 2008). Although common diseases are currently being treated more often by the use of synthetic medicines specifically developed in laboratories. Their definite effects in the treatment of diseases have contributed to their widespread use, however, the use of some of them leads to certain damages to the body. Thus, the importance of medicinal plants and their products is increasingly gaining recognition and the public confidence in their use is constantly becoming more and more stronger (Zargari, 1992). Currently, the clinical, pharmaceutical and chemical studies of these traditional plant derived drugs are the basis of many early drugs such as Aspirin (from willow bark), Digoxin (from Foxglove), Morphine (from Opium poppy), Quinine (from Cinchona skin) and Pilocarpine (from Maranham Jaborandi). Currently, it is estimated that over 50% of the available drugs have been derived from plants (Yarnell, 2002; Harvey, 2008). Phytotherapy is widely being used across the world on a constantly growing basis. Therefore, the global trend of synthetic compounds has turned to herbal drugs, which we can refer to as a return to nature in preventing diseases and pains. Nature has been served as the source of medicinal herbs (Fabricant, 2001).

DESCRIPTION OF THE PLANTS

Senna Occidentalis

Senna occidentalis or Cassia occidentalis, Nigerian vernacular name '*Rai Dore or Tafasar Masar in Hausa', 'Akidi ogbara' in Igbo,* 'Abo rere' in in Yoruba. Its vernacular names in English include **septicweed**, (USDA,NRCS, 2015) **coffee senna**, (Government of Australia, 2018), **coffeeweed**, **piss-a-bed**, (Allsopp, Richard, 1996a) **Mogdad coffee**, **negro-coffee**, **senna coffee**, **Stephanie coffee**, **stinkingweed** or **styptic weed** (Allsopp, Rischard, 1996b), Senna occidentalis L. is a pantropical plant species, native to America (Rotton and Klitgard, 2021) It is a perennial herbs that grows throughout tropical Africa. (Vijayalakshmi, 2013; Mahanthesh, 2019).), Asia and some regions in America (Al-Snafi, 2015).The species was formerly placed in the genus *Cassia.* The plant is widely used by the local people of Hausa-Fulani tribe in northern Nigeria for the prevention and treatment of various diseases (Alhassan, *et al.*, 2018). The leaves, roots and other parts of the plant are used for medication by people

from different parts of the world (Isah, 2018). Furthermore, the leaves are used for the treatment of rheumatism, typhoid fever, tuberculosis, asthma and diabetes (Al-Snafi, 2015). The *in vitro* and *in vivo* antitrypanosomal effects were also reported using the ethanolic leaves extract of the plant (Ibrahim *et al.*, 2010). However, despite many medicinal claims, seeds of S. *occidentalis* have been reported to be poisonous to animal and humans (Gebrezgi, *et al.*, 2020) because it contains a known toxic derivative of anthraquinone called emodin (Chukwujekwu, et.al., 2006). The seeds are also said to contain chrysarobin (1,8-dihydroxy-3-methyl-9-anthrone) and N-methylmorpholine.

Figure 1: Senna Occidentalis (Source: Field work)

Senna Obtusifolia

The plant senna obtusifolia (Cassia tora, English common name) with english vernacular names of foetid cassia, sickle senna, Chinese senna, Sicklepod, coffeeweed, coffeepod, java bean, or arsenic weed, belonging to the kingdom plantae, family fabaceae is a common annual plant that grows wild in Northern Nigeria. The plant is considered a serious weed to Agriculturalists in many places. The plant is found throughout tropical Africa and it is an

annual herb that commonly grows wild in Northern Nigeria. It is a competitive woody shrub that grows vigorously across the tropics. It grows on well-drained fertile soil. Similarly, it is suited for cleared coastal forest countries (Irwin and Barneby, 1982). Reports indicated that Senna obtusifolia (L.) is used as mulch interplant to smother weeds in the crop interrows and to generate mulch in situ for the production of C. frutescens; Sombo (Nigeria), Tabasco (Benin). Senna obtusifolia has been regarded as indigenous leafy vegetable of the Sahel with potential of providing vegetable to the rural population in the months of August and September (Paster, et,al., 2007). Senna obtusifolia is found throughout tropical Africa with the exception of Madagascar. It was earlier introduced into Africa from America, where it showed far more variation. In Africa, the fruits are broad as in specimens from the Caribbean and southern united states, which suggests a Caribbean origin of the African plants. In Asia, plants with broad fruitsare are widespread, but in the Philippines, only plants with needle-like fruits occur. The young tender leaves of Senna obtusifolia is occasionally used as vegetable throughout Africa and elsewhere and the plant is cultivated in home for this purpose in several countries including Senegal, Ghana, Cameroon, and Ethiopia. Older leaves if eaten frequently or in large quantities will cause diarrhea (Irwin and Barneby, 1982). The leaves and seeds of this plant have nutritive value and contain important minerals (Sudi *et al*., 2011). Medicinally, the leaves and seeds are used as remedy for skin diseases, itch and the leaves extract exhibited antifungal activity against ringworm. A decoction of the leaves is used traditionally for children suffering from feverish attacks during teething. The leaves decoction is also used for the treatment of scorpion stings, diarrhea, dysentery and gingivitis (Sudi *et al*., 2011). The boiled powder of the seeds is used as blood-purifier (Shadab, Shamsi and Ahmad, 2019).

In Nigeria, the seeds, leaves, and roots of Senna obtusifolia do no doubt posses' laxatives effects. However, its leaves are used as decoction febrifuge and for the treatment of scorpion stings, gingivitis, dysentery and diarrhea (David, 2002; Fowler, 2006). As the seeds are reputedly poisonous, therefore cooking or roasting it is necessary before eating. The cooked vegetable tastes bitter but has an attractive consistency. Senna obtusifollia will probably remain a minor vegetable. Seed gums are used worldwide for a variety of industrial

application, increasing the demand and inconsistency of supply and price driven industrial users to search for new sources of supply and Senna obtusifolia is a good alternative for locust bean (Ceratonia siliqua L.) and guar (Cyomopsis tetragonolobia (L) taub).

Our ancestors identified numerous plants, herbs and shrubs based on their medicinal property and used them in treating many diseases. Cassia tora is one among the herbs that were identified and found to be supportive in curing skin problems like ringworm, leprosy, skin infections, etc. Apart from that it is also used for treating liver disorder. The medicinal properties of this plant also justify more research. However, the weedy nature and the toxic properties require caution (Irwin and Barneby, (1982). The popularity of the plant seeds has necessitated its requirements in pharmaceutical industry. However, when it comes to buying, it should be from a certified manufacturer and supplier and Altrafine remains the best.

Figure 2: Senna Obtusifolia(Cassia Tora) (Source: Field work)

MATERIALS AND METHODS

Equipment and apparatus

The following apparatus and equipment were used in the study: Beaker, plastic bottle, volumetric flask, test tube, conical flask, oven, whatman filter paper No 42 (125mm), TLC plates, soxhlet extractor, electronic balance, pH meter, capillary tubes, tripod stand, dropping pipette, measuring cylinder, magnetic stirrer, hot plate, moisture disc, crucible, muffle furnace (Nabertherm), mortar and pestle.

Chemicals and reagents

Analytical grade reagents including acetic acid, ethanol, ammonium hydroxide, $FeCl_3$, HCl, potassium ferrocyanide, aqueous ethanol, diethyl ether, aqueous sodium chloride, aqueous methanol, acetic anhydride, ethanolic acid, H_2SO_4, chloroform, concentrated H_2SO_4, glacial acetic acid, ferric chloride, and aqueous hydrochloric acid, potassium hydroxide, HNO_3, Phenolphthalein, mayer's reagent (potassium mercuric Iodide), and sodium hydroxide were used throughout.

Sampling site

Samples were collected during the rainy season on an uncultivated plot in Dogon-karfe area of Dutsin-ma metropolis of Dutsin-ma Local Government, Katsina state, Nigeria.

Sample collection and preparation

The plant samples were collected, washed and air-dried. Then they were grounded to fine powder using mortar and pestle and sieved through a 24-mesh sieve and the powdered samples were weighted and stored at room temperature.

Preparation of extracts

Dried powders of the plants leaves were continuously and separately refluxed with ethanol at 40-80 ^oC for 3 hours using soxhlet apparatus. The solvent extract was then stored in air-tight containers at 40 ^oC for further use.

Preliminary phytochemical screening

The analysis of phytochemicals from the solvent free extract of senna occidentalis and senna obtusifolia were performed individually using different qualitative tests for alkaloids, flavonoids, saponins, tannins, steroids, glycosides, anthraquinones and carbohydrates.

Detection of carbohydrates

Carbohydrates were tested using Fehling's reagent Test
To 2 cm^3 of each extract, 5 cm^3 of a mixture of Fehling's solutions A and B were added and the mixtures boiled in a water bath for five minutes.
Brick red precipitation indicates carbohydrates presence.

Determination of Alkaloids

Alkaoids were determined using Mayer's test:
To 1 cm^3 portions of each extracts, 3 drops of 1M Hydrochloric acid was added to acidify the extract. They were then treated with 5 drops of Mayer's reagent (potassium mercuric Iodide).
Formation of a yellow or white colored precipitate or turbidity indicates the presence of Alkaloids.

Detection of Anthraquinones

For detecting the presence of Anthraquinone derivatives present in the extracts, potassium hydroxide solution was added to each of the solutions in separate test tubes.
Anthraquinone gives blood red coloration.

Detection saponins

Saponins were detected using the foam/frothing Test
To do the test, 0.5g of each extract was shaken vigorously with 2 cm^3 of water.
If foam/froth is produced and persists for ten minutes or more, it indicates the presence of saponins.

Test for steroids

Two cm^3 of acetic anhydride was added to 0.5 g each ethanolic of each sample followed by 2 cm^3 H_2SO_4.

The colour changed from violet to blue or green in some samples indicating the presence of steroids.

Test for flavonoids

To 1 cm^3 of each of the extracts, a few drops of dilute sodium hydroxide solution were added.

An intense yellow colour was produced, which become colourless on addition of a few drops of dilute acid. This indicates the presence of flavonoids.

Determination of Tannins

Tannins were determined using Ferric chloride Test

A small quantity of the extract was boiled with water and filtered. Two drops of ferric chloride was added to the filtrate.

Formation of a blue- black, or green blackish color in the presence of ferric chloride precipitate was taken as evidence for the presence of tannins.

RESULTS AND DISCUSSION

The results obtained in this research are presented in Table 1.

Table 1: Levels of phytochemicals in senna occidentalis and senna obtusifolia leaves

PHYTOCHEMICAL	LEVEL OF PHYTOCHEMICAL IN LEAVES OF	
	SENNA OCCIDENTALIS	SENNA OBTUSIFOLIA
Carbohydrates	Low	Low
Flavonoids	High	Medium
Saponins	High	Absent
Tannins	High	High
Steroids	High	High
Anthraquinones	Medium	Low
Alkaloids	Medium	High

The results presented in Table 1 reveal the presence of the seven tested phytochemicals in the leaves of both plants except for saponins which is

completely absent in cassia tora (senna obtusifolia). Flavonoids, saponins, tannins and steroids are present at high levels in senna occidentalis, anthraquinones and alkaloids were present at medium or moderate levels while carbohydrates were present at low levels in the same senna occidentalis. The results are consistent with those obtained by Sambasivam et.al., (2016) who carried out a study on phytochemical and nutritional properties of aerial parts of cassia occidentalis L. The results obtained revealed that the Preliminary phytochemical analysis of the aqueous extract of the plant exhibited the presence of alkaloids, carbohydrates, flavonoids, phenolic compounds, tannins, and lignins. Flavonoids were observed to have recorded a higher percentage of yield (2.45 mg/g sample) when compared with alkaloids (1.56 mg/g sample), lignin (0.34 mg/g sample), tannins (0.21 mg/g sample), and phenols (0.16 mg/g sample) in the aerial part of C. occidentalis.

However, in senna obtusifolia, results of the current study revealed that tannins, steroids and alkaloids exhibited signs of high concentration, while flavonoids were present at medium(moderate) levels and carbohydrates and anthraquinones were present in the plant leaves at low concentrations. The presence of these phytochemicals(tannins, flavonoids, terpenoids, saponins, steroids, phlabathannins, alkaloids) in cassia tora in the present study is in total agreement with the result of Isma'ila et.al., (2011) which states that the result of phytochemical screening of Senna obtusifolia leaves and seeds shows that all the phytochemical (tannins, flavonoids, saponins, terpenoids, steroids, phlabathannins, alkaloids) investigated are present in leaves and seeds of Senna obtusifolia except saponnins which is absent in both extract. The results are also consistent with those obtained by Vasanthi et al. (2014) on the Phytochemical screening and antioxidant activity of extracts of the leaf and bark of Albizzia lebbeck (Benth) which revealed the presence of phenols, steroids, tannins, saponins and flavonoids in the hydroalcohol leave and bark extracts with percentage yields of the constituents of leaf hydroalcohol as, alkaloids (0.10%), flavonoids (10.45%), steroids (32.18%), saponin (26.92%), phenols (40.81%) and tannin (30.69%). The percentage yield of the constituents of bark hydroalcohol were alkaloids (0.16%), flavonoids (6.73%), steroids (28.35%), saponin (21.53%), phenols (33.34%), and tannin

(27.16%). and is contrary to observations made by Doughari, et al, (2008) who were able to detect saponins in acetone extract of Senna obtusifolia. This could be suggestive that environmental factors could be responsible for the presence or absence of saponin in Senna obtusifolia plant.

The data obtained in the present work revealed interesting chemical features of both plants leaves, which were tabulated (Table 1.0). The leaves of senna occidentalis is bitter in taste and green in color, and has a pleasant odor.

Secondary metabolites in these and other plants play both a defensive role against herbivore, pathogen attack, and interplant competition, and an attractant role toward beneficial organisms such as pollinators or symbionts (Wink & Schimmer, 1999). Plant secondary products also have protective actions in relation to abiotic stresses such as those associated with changes in temperature, water status, light levels, UV exposure, and mineral nutrients.

Furthermore, previous work has indicated potential role of secondary products at the cellular level as plant growth regulators and modulators of gene expression, and in signal transduction (Kaufman, et.al., 1999). Flavonoids present in the plants might be responsible for their anti-inflammatory properties (Kunle and Egharevba, 2009). Alkaloids are a diverse group of secondary metabolites found to exhibit antimicrobial activity. Alkaloids are also known for decreasing blood pressure, balancing the nervous system in case of mental illness, and possessing antimalarial properties (Ronan, et.al., 2009). Tannins help in wound healing, act as an anti-parasitic agents, and can reduce the risk of coronary heart diseases. Phenolic compounds are one of the largest and most ubiquitous groups of plant metabolites (Singh and Singh, 2007). Natural antioxidants mainly come from plants in the form of phenolic compounds such as flavonoids, phenolic acids, etc. (Ali, et.al., 2008). A number of previous studies have focused on the biological activities of phenolic compounds, which are potential antioxidants and free radical

scavengers. Modern clinical studies have supported the role of steroids as anti-inflammatory and analgesic agents (Singh, 2006). The levels of steroids as determined in the present study are high in both plats.

Furthermore, Belay and Sisay (2014) observed in the studies of phytochemical Constituents and Physicochemical Properties of medicinal

Plant (Moringa Oleifera) Around Bule Hora that plant products including phenolic, quinines, saponins, Flavonoids, coumarins, tannin, steroids and Alkaloids were present in the plant which were assumed to be responsible for the numerous applications of the plant traditional healings. Fats and oil was found to be present in the plant in small amounts but anthraquinones and protein were detected. They noted that the presences of these phytochemical constituents in plants promote rapid healing and the formation of new tissues. They also observed that Flavonoids were more in quantity than the other phytochemicals tested. Flavonoids, according to the research may modify allergens, viruses and carcinogens thereby acting like a biological response modifier and acting on bacteria by inhibiting its protein synthesis. Also, in vitro studies showed that flavonoids could also posses anti-microbial (Galeotti, et.al, 2008), anti-allergic and anti-inflammatory properties (Yamamato and Gaynor, 2000). Phytochemicals such as Coumarins, Saponins, Quinine and alkaloids were found to be moderate in concentration. Steroids are used in the stimulation of bone marrow and growth and stimulates lean body mass. It also play vital roles in the prevention of bone loss in elderly people (De-piccolli, et.al., 1991). Tannins, saponins, and Steroid-glycosides were found to be relatively low in concentration. Tannins could be an effective ameliorative agent of the kidney (Bajaj, 1998). Tannins have also been shown to be potential anti-viral, anti-bacterial and anti-parasitic agents (Liu, 2004), Saponins are used as an adjuvant in the production of vaccines.

Therefore, the combined effects of the plant secondary metabolites observed in these two plants is what could be responsible for their diverse applications in ethno medicine.

CONCLUSION AND RECOMMENDATION

Results obtained in this research reveal the presence of the seven tested phytochemicals in the leaves of both senna occidentalis and senna obtusifolia at varying levels except for saponins which were observed to be completely absent in cassia tora (senna obtusifolia). Flavonoids, saponins, tannins and steroids were present at high levels in senna occidentalis, anthraquinones and alkaloids were present at medium or moderate levels while carbohydrates were present at low levels in the same senna occidentalis. However, in senna

obtusifolia, results of the study revealed that tannins, steroids and alkaloids were present at high concentrations, while flavonoids were present at medium(moderate) levels and carbohydrates and anthraquinones were present in the plant leaves at low concentrations. It was concluded that the presence of these phytochemicals in the leaves of the two plants could be the reason for their diverse applications in ethno-medicine. Therefore, exhaustive studies was recommended to determine the presence and levels of other phytochemicals in the extracts, isolate them and elucidate their structures to enable them to be targeted towards drug development/discovery.

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