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PHYTOPHARMACOLOGICAL EVALUATION OF *LANTANA CAMARA* LEAVES' SMOKE

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ABSTRACT

Lantana camara has been named as one of the most important medicinal plants in the world. The plant has been used in various communities for treatment against various diseases. The plant has been found to have antibacterial activity, anticancer activity, anti-fungal activity, antihelmentic activity, anti hyperglycemic activity and antioxidant activity. The plant's leaves smoke has also been found to have mosquito repellent activity. The current study was done to evaluate phytochemistry of the smoke from its leaves. This study revealed the presence of several compounds from its smoke. Acetone extract was found to contain only alkaloids, methanol extract was found to contain tannins, flavonoids, alkaloids and steroids while the aqua extract was found to contain only flavonoids. Further research needs to be done to determine the structural composition of these compounds their mode of action and their effect in the in vivo environment.

KEY WORDS

Lantana camara, Leaves, Phytochemical, Smoke

INTRODUCTION

Lantana camara (Figure 1) has been named as one of the most important medicinal plants in the world. The plant has been used in various communities for treatment against various diseases. The plant has been found to have antibacterial activity, anticancer activity, anti-fungal activity, anthelmintic activity, anti hyperglycemic activity and antioxidant activity [1]. The plant's leaves smoke has also been found to have mosquito repellent activity.

Fig.1 *Lantana camara* Plant

Research on medicinal plants is of great importance taking into account the old and new problems emerging day by day. Medicinal plants are available in nature and the grand's have information about their medicinal value traditionally [2]. The information about natural healing methods was passed from grand's to children and grandchildren from one generation to another. With growing knowledge on technology and civilization this information transfer is no longer taken seriously in the society, hence, endangering the knowledge of traditional methods of treatment, one of them is the use of medicinal plants. This calls for a great need to have the knowledge on medicinal plants reserved and kept for future reference.

With the increase in diseases caused by the modes of living and emerging drug resistant microbes, back-to-nature is becoming a common acronym for many people in the world today. The use of plants in the past clearly expresses the fascinating relationship between mankind and plants since ancient times. Due to lack of clear knowledge of the mode of treatment of certain plants, people in the past have attributed the healing of diseases using medicinal herbs to supernatural forces due to their indisputable healing capability [3]. The use of traditional plants has been practiced since time immemorial, however; the isolation of active compounds such as morphine, quinine and alkaloids in the past 200 years ushered in the dawn of a new era in the use of medicinal plants and marked the beginning of modern research in the use of plants to cure diseases [4].

Out of the 600 species of medicinal plants from 125 families tested against *P.gallinaceum* in chicks, *P.cathemerium* and *P.lophurae* in duckling 33 species were found to possess high potential in the treatment against the microbes, with the highest being plants amaryllidaceae and simaroubaceae family [5]. Medicinal plants have since ancient times been used to treat many illnesses which affect humankind even today. Many traditionalists have done this for quite some time and therefore prevented many deaths in the past few decades. However, this has been done with little scientific prove on the efficacy and the toxicity of the extracts on the affected individuals. Herbal medicine is still a matter of argument in the current world with many still skeptical on its efficiency. This has been due to greedy practitioners who want to become wealthy by pretending to know much about the diseases which their clients claim to have, hence, leading to the application of wrong treatment and administration of wrong drugs which do not cure the patient and therefore leading to the worsening of the situation or even the death of the victim [6]. Much scientific data needs to be provided in order to create the needed confidence in the use of medicinal plants.

Plants have been known to possess multiple medicinal properties, hence, enabling them to have several uses in the pharmaceutical industry. Studies on several plants have been done all over the world and plants have shown great potential in the treatment of diseases affecting both humans and animals. Study reports on plants have shown them to have anti-hyperglycemic, hypoglycemic, anti-hyperlipidemic, antitumor, antioxidant, anti-inflammatory and anti-ulcerogenic properties [7]. The use of medicinal plants is as old as man [8]. In the past few decades medicinal plants have been tested extensively and found to have several pharmacological uses, such as antibacterial activity, antifungal activity, anti-diabetic activity, anticancer activity, antioxidant activity, hepatoprotective activity, haemolytic activity, anti-inflammatory activity, larvicidal activity, anthelmintic activity, central nervous system activity and pain relief activity [9, 10, 11 & 12].

Many side effects associated with allopathic medicines and dependencies are common reasons why many people are hospitalized today. In order to counteract the effects many people are now turning to nature in pure form to prevent and cure diseases using natural medicinal herbs or natural health alternatives [13].

The use of smoke in the preservation of foodstuffs has been in use, especially in the developing countries with great success. Traditionally cereals such as maize are put in the kitchen roofs which use firewood as fuel. When the firewood is burnt a lot of smoke is

produced which upon coming into contact with the cereals they form a protective layer on top the cereals hence protecting it from insects. The use of volatile compounds have been studied in the past and proved to possess significant repellent effect [14]. The use of *Lantana camara* has been found to have immense repellency against female *Anopheles* mosquitoes [15]. Traditionally, people inhale the smoke of certain parts of plants in treatment of various diseases. The current study was done to analyze the phytochemical composition *Lantana camara* leaves smoke.

MATERIALS AND METHODS

Sample Collection and Preparation:

The herb was randomly collected in the natural forest around University of Eastern Africa, Baraton. The plant samples were collected and identified by a taxonomist in the Biology Department, Baraton University. The samples were allowed to dry at room temperature under a shade. The dry samples were then crushed in fine powder and stored in tightly sealed polyethylene bags.

Extraction procedure:

The plant smoke was harvested by burning it under an inverted glass filter funnel. The funnel was connected to a conical flask containing different solvent, one at a time **(Fig.2).** A vacuum pump was connected to the conical flask in order to create a partial vacuum in the flasks hence sucking in the smoke through the solvent. Each incoming pipe was dipped into the solvent and the un-dissolved smoke sucked from the top of the flask through the leaving pipe to the next conical flask. This process was allowed to continue until the solvents turned color, indicating presence of dissolved matter. The resulting solution was then concentrated using a rotor vapor machine and the extracts obtained and stored in a refrigerator at 4^{o}C, to be later used for the analysis.

Fig.2 Extraction setup

Qualitative Phytoconstituents Analysis:

The extracts' phyto-constituents analysis for identification of bioactive chemical constituents was done using standard procedures with slight modifications [16, 17, 18 &19].

Tannins:

About 0.5 g of the sample was put in a test tube and 20 ml of distilled water was added and heated to boiling. The mixture was then filtered and 1 % of $FeCl_3$ was added to the filtrate and observations made. A brownish green color or a blue, black coloration indicated the presence of tannins.

Saponins:

The crude extract was mixed with 5 ml of water and vigorously shaken. The formation of stable form indicated the presence of saponins.

Flavonoids:
A portion of the aqueous extract was added in a test tube. To this, 5 ml of dilute ammonia and 2 ml of concentrated sulfuric acid was added. The appearance of a yellow color indicated the presence of flavonoids.

Terpenoids:
The extracts of the plant material were taken in a clean test tube, 2 ml of chloroform was added and vigorously shaken and then evaporated to dryness. To this, 2 ml of concentrated sulfuric acid was added and heated for about 2 minutes. A grayish color indicated the presence of terpenoids.

Glycosides:
Salkowsks' test: The solvent extract of the plant material was mixed with 2 ml of chloroform and then 2 ml of concentrated sulfuric acid was carefully added and shaken gently, then the observations were made. A red brown color indicated the presence of the steroid ring (glycone portion of glycoside)

Alkaloids:
The crude extract was mixed with 1% of HCl in a test tube. The test tube was then heated gently and filtered. To the filtrate, a few drops of Mayer's and Wagner's reagents were added into the test tube. A resulting precipitate confirmed the presence of alkaloids.

Steroids:
Liebermann Burchard reaction: About 2 g of the extract was put in a test tube and 10 ml of chloroform was added and filtered, then 2 ml of the filtrate was mixed with 2 ml of a mixture of acetic acid and then concentrated sulfuric acid is added along the side of the test tube. Blue green ring indicated the presence of steroids.

Phenols:
The plant's solvent extract was put in a test tube and treated with a few drops of 2% of $FeCl_3$. Formation of bluish green coloration indicated the presence of phenols.

RESULTS AND DISCUSSION

Table 1: Phytochemical analysis of *Lantana camara* leaves smoke

Phytochemical	Acetone	Methanol	Water
Tannins	-	+	-
Saponins	-	-	-
Flavonoids	-	+	+
Terpenoids	-	-	-
Glycosides	-	-	-
Alkaloids	+	+	-
Steroids	-	+	-
Phenols	-	-	-

From the study the plant leaves smoke was found to contain several compounds (table 1). Acetone extract was found to contain only alkaloids, methanol extract was found to contain tannins, flavonoids, alkaloids and steroids while the aqua extract contained only flavonoids.The presence of these important phytochemicals is an indication of the great pharmacological importance of the plant when used in the traditional way.

Alkaloids which are secondary metabolites, they can be defined as cyclic compounds which have nitrogen in a negative oxidation state. They affect the chemical transmitters' action of the nervous system. They also have other pharmacological activities such as analgesic, antispasmodic, antihypertensive, anti-arrhymic and antibacterial effects. Alkaloids have been found to have antimalarial activity [20]. The compounds have also been used clinically to treat malaria, colic and stomach ulcers and used in

anticancer drugs [21]. According to Karou [22], much study has been done on pharmacological properties of alkaloids on antiprotozoal, cytotoxic and anti-inflammatory properties.

Alkaloids have been isolated from different plants and their medicinal values tested. The most important use of alkaloids already known with its originality from plants is the use of alkaloids compounds in the treatment of malaria. According to Ameyawn [4], many of the antimalarial drugs used today are alkaloids derived from plants [23]. Alkaloids have been identified for their functions, which include analgesic, anti-plasmodic and anti-bacterial activity [24]. According to Ayitey [25], bitter leaves containing alkaloids are capable of reducing headache associated with hypertension.

Flavonoids can be used as anti-diabetic. According to Namki [26], flavonoids can be used to prevent synthesis of flavours that are caused by fat oxidation. Flavonoids have been found to have antibacterial activity due to their ability to complex with extracellular and soluble proteins and to complex with bacterial cell wall [27]. Flavonoids are produced by plants in response to microbial infection and studies have shown that they have antibacterial activity against a wide range of micro-organisms [28].

Flavonoids are known to contain specific compounds called antioxidants, which protect human, animal and plant cells against the damaging effects of free radicals. Imbalance between free radicals and antioxidants leads to oxidative stress, which has been associated with inflammation, autoimmune diseases, cataract, cancer, Parkinson's disease, aging and arteriosclerosis. It also plays a role in heart diseases and neurodegenerative diseases. Flavonoids have also vasodilator activity, a property which is useful in improving blood circulation in the brain and in Alzheimer disease [29]. Several isoflavone can be used to improve blood circulation. Furanocoumarins a type of flavonoids has been found to inhibit growth of tumor in mice. Free radicals, including the hydroxyl, hydrogen peroxide, superoxide and lipid peroxide have been associated with a number of diseases such as cardiovascular disease, cataracts, diabetes, gastrointestinal inflammatory diseases, cancer, asthma, liver disease, macular degeneration, periodontal disease and other inflammatory processes.

Tannins are also secondary metabolites in plants. They are glycosides of garlic or protocatechvic acids. There astringent property makes them useful in preventing diarrhea and controlling hemorrhage due to their ability to precipitate proteins, mucus and constrict blood vessels [6]. This is the reason why traditional healers use plants rich in tannins to treat wounds and burns since they are able to cause blood clotting. Some tannin has been reported to inhibit HIV replication selectively besides the use of diuretics [30]. This shows how traditional medicinal plants rich in tannins can be used to control this dangerous disease. Tannins have also shown antiparasitic effects [31]. According to Bajal [32], tannins can also be used to protect the kidney since when taken the polio virus, herpes complex virus and various enteric viruses are inactivated. Foods rich in tannins can be used to treat hereditary hemochromatosis, which is a hereditary disease characterized by excessive absorption of dietary iron. According to Chung [32], many tannin molecules have been shown to reduce the mutagenic activity of a number of mutagens. The anti-carcinogenic and anti-mutagenic potentials of tannins may be related to their antioxidative property which is important in protecting cellular oxidative damage including lipid peroxidation. The growths of many fungi, yeast, bacteria and viruses have been proven to be inhibited by tannins. Tannins have also been reported to exert physiological effects, such as to accelerate blood pressure, decrease the serum lipid level, and produce liver necrosis and module immune responses. The dosage and kind of tannins are critical to these effects [33].

CONCLUSION

From the results obtained in this research it can be affirmed that the presence of these important phytochemicals makes the smoke of *Lantana camara* very useful as a medicinal remedy. The repellency of the plant smoke documented by Akumu [15] could directly be attributed to the presence of these compounds. The data obtained in this research is a scientific justification for the traditional use of plant smoke to preserve cereals. The results documented in

the research by Akumu et al [15[, the methanol extract had better repellency activity than all the other solvents used, an observation which is clearly proved by the current study in which methanol extract was found to have the highest number of phytochemicals in the current study. From the results obtained in the current study, in comparison with the previous on the plant smoke, it is worthy to conclude that the pharmacological activity of the plant smoke could be due to a synergistic action of two or more phytochemicals. Further research needs to be done in order to identify the exact active compounds their pharmacological value, their mode of action and their toxicity in the *in vivo.*

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