ANTI-MICROBIAL ACTIVITIES OF ESSENTIAL OIL EXTRACTED FROM THE WHOLE PLANT OF SENNA OCCIDENTALIS (SEPTIC WEED)

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ABSTRACT

The study investigated the anti-microbial activities of the leaves of *Senna occidentalis* in the treatment of some bacteria diseases. 385.50g of *Senna occidentalis* leaves was plucked in an open field of Zebe, Ajara Agamathan in Badagry, Lagos State and was subjected to hydro-distillation by the use of Clevenger apparatus for 4 hours. The volatile oil obtained was bottled and weighed with a percentage yield of 0.078%. The oil from the leaves were cultured(with some antibiotics used as control) Amoxillin, Cotrimoxazole, Ciprofloxacin Tetracycline, Gentamycin, Nitrofurantoin, Nalidixicin, Ofloxacin, Agumetin, Colistin on each nutrient agar (ASA) plates at 37 ^{0}C for 24 hours and were tested against some organisms such as: *(Escherichia coli, Salmonella Sp., Bacillus Sp., Staphylococcus Sp., Klebsilia Sp).* The study revealed that the essential oil extracted did not inhibit activity against all the organisms. This indicates that oil extracted from *Senna occidentalis* leaves cannot be used to control the microbes at the (0.2ml) concentration used. Further investigation showed that two (Ciproflaxocin and Oflaxocin) of the entire antibiotics used as control inhibited the growth of the microbes. Thus, an infection caused by *Senna occidentalis* can be cured by Ciproflaxocin and Oflaxocin antibiotics.

Keywords: *Senna occidentalis, Anti-microbial, Microorganisms, Essential oil.*

INTRODUCTION

There is a growing interest on the use of natural antibacterial compounds. Such as essential oils, extracts of various species of edible or medicinal plants and herbs. The antibacterial compounds have long been used as natural agents for food preservation due to the presence of antimicrobial compounds (Nychas et al., 2003). In general, plant that derived essential oils are considered as non-phytotoxic compounds and potentially effective against microorganisms. Study has also shown that when essential oils are inappropriately used, they can give rise to adverse effects to humans such as skin irritation, headache and nausea (Aromacaring, 2004).

Senna occidentalis (septic weed) formally called *Cassia occidentalis* belong to the family of Fabaceae pea. The plant originated in the tropical America and can be distributed through the tropical and subtropical regions of the world (Barbosa et al., 2005). Senna is a tribe of cassia and subfamily of caesalpinioideae. It is usually grown in sandy and loamy disturbed soil, often in colonies around pens or shade trees rather than uniformly distributed over a pasture i.e. a weedy

disturbed areas and waste areas (Villa et al., 2004). Barbosa et al., (2005) cited in Ibrahim et al., (2010) buttressed that *Senna occidentalis* can be mostly found in an open pastures or field cultivated with cereals such as soy bean, corn, sorghum and others. The seeds may be eaten by stock with mature seed germinating in the dung (Luckow, 1996 and Smith 2002).The extracts or powdered leaves of senna are used for several purposes as an analgesic, antibacterial, antifungal, anti-inflamatory, antiseptic, antispasmodic, febrifuge, insecticidal among others (Stone et al., 1970; Hussain and Deeni, 1991). In addition, the senna plants are well known for a group of chemicals with strong laxative actions called anthraquinones. The action of the anthraquinone chemicals are the basis of senna's wide spread use as a purgative and strong laxative (Feng et al., 1962). *Senna occidentalis* has been used as natural medicine in the rainforest and other tropical areas for centuries. Its roots, leaves, flowers and seeds have been employed in herbal medicine around the world. The leaf extracts have demonstrated weak uterine stimulant activity and smooth muscle relaxant actions in rats (Jafri et al., 1999). *Senna occidentalis* has demonstrated hypotensive activity in dogs as such is probably contraindicated in people and single high dosage of *Senna occidentalis* seeds cause toxic reactions (Jafri et al., 1999). Silva et al., (2003) also established that the plant is a toxic leguminous plant found as a contaminant crop. However, many studies have been carried out on anti-microbial activities on the leave of *Senna occidentalis* (Ehssan, 2012; Mizanur et al., 2013), but there is little or no information on the anti-microbial activities of essential oil extracted from the leaves of *Senna occidentalis*. Thus the significance of essential oil of *Senna occidentalis* to human has initiated this study.

Essential oil

Essential oil is any concentrated hydrophobic liquid containing volatile aroma compounds from plants, which are called aromatic herbs or aromatic plants. They are highly concentrated natural plant extracts. They are the life blood of the plant, protecting it from bacterial and viral infections. They are also known as volatile or ethereal oils or simply as the "oil of" the plants material from which they were extracted such as oil of clove. Essential oil does not as a group need to have any specific chemical properties in common, beyond conveying characteristic fragrances. They are generally extracted by distillation, hydro-distillation, cold pressing. They are used in perfumes and cosmetics, for flavouring food and drink and for scenting incense and household cleaning products (ISOTC, 2006). Essential oils are used as flavouring and fragrance agents in every possible application. Combinations have raised greatly the total sales volume; e.g mint and cinnamon are used in toothpaste, mouthwash or lozenges. Combinations can be found in every fragranced product, such as room fresheners, paper, printing ink, paint, candles, soap condiments, floor polish etc.

Convenience foods and frozen foods are flavoured best by essential oils or oleoresins. Although citronella oil was used as such as an insect repellant, today synthetic repellants have many fragrances. Flavour essential oils are encountered in baked goods, snack foods, soft drinks, liqueurs, tobacco, sauces, gravies, salad dressing and other food products.

MATERIALS AND METHODS

Collection of materials

Senna occidentalis was plucked from the plant in Zebe, Ajara Agamathen Badagry Lagos State in an open field and was used fresh.

Preparation of extracts

Extraction of essential oil (volatile oil).

The leaves of *Senna occidentalis* was collected and weighed to about 382.50g using the weighing balance (OHAUS Pioneer PA512 weighing balance). After weighing the plant, an empty sample bottle used in collecting the oil was weighed in order to arrive at the actual weight of the sample. The plant was transferred into the hydro-distiller flask and water was added above the plant material. Then the distillation was done for 4 hours in accordance with the British pharmacopea. After a period of 4 hours, the oil was collected through the outlet tap into the sample bottle and was weighed.

$$\% \text{ yield of the oil } = \frac{W2 - W1}{100}$$

Where W_1 = Weight of empty sample bottle, W_2 = Weight of oil + Weight of sample bottle

Chemical reagents

All reagents/chemicals were of analytical grades and they were obtained at department of chemistry, Lagos State University (LASU).

Anti-microbial Analysis

The anti-microbial analysis was carried out using standard method as indicated below:

Antibacterial Screening Test Using the Agar Disc Method.

Antimicrobial activity was determined by using Disc Diffusion following the method described by the National Committee for Clinical Laboratory Standard (NCCLS) (2002).The micro-organisms of choice used for the investigation were *Escherichia coli*, *Salmonella* sp., *Bacillus* sp., *Staphylococcus* sp., *Klebsilia* sp. 17g of the Mueller hinton agar was weighed and dissolved in 500ml of distilled water. The dissolved Mueller-hinton agar was sterilized at about 121^0C for about 15 minutes then the solution was allowed to cool to 45ºc.The Mueller-hinton agar was poured into a fresh sterile plate in about 15-20ml to solidify. After solidifying, the Agar plate was innoculated with the selected organism by streaking it across the face of the plate with a wire loop and a new plate with 7 sterile filter disc was soaked with 0.2 ml of raw volatile oil using the syringe and was placed into a cultured plate. Then a commercially produced anti-biotic sensitivity compound disc was introduced into a new cultured plate inoculated with organism and sterile disc oil and all the plates were incubated for 24hrs at the temperature 37ºC.

RESULT AND DISCUSSION

Table 1: Anti-microbial activity of oil extracted from *Senna occidentalis* on some selected micro-organisms.

Micro-organisms	***Senna occidentalis***
Salmonella sp	-
Staphylococcus sp	-
Escherichia coli	-
Klebsiellia sp	-
Bacillus sp	-

Negative (-) means no inhibition

Table 2: Antimicrobial activity of control antibiotics on some selected micro-organisms

Control antibiotics	***Salmonella* sp**	***Staphylococcus* sp**	***Escherichia coli***	***Klebsiellia* sp**	***Bacillus* sp**
Amoxillin	-	-	-	-	-
Cotrimoxazole	±	-	-	-	-
Ciprofloxacin	+	+	±	+	+
Tetracycline	-	+	-	-	-
Gentamycin	-	+	-	-	±
Nitrofurantoin	-	±	-	-	-
Nalidixicin	-	-	-	-	-
Ofloxacin	+	+	+	+	+
Agumentin	-	-	-	-	-
Colistin	-	-	-	-	-

Positive(+) means inhibition

Positive and Negative (±) means moderate inhibition

Table 1 shows the antimicrobial activity of oil extraction from *Senna occidentalis* on selected micro-organisms. The result showed that the percentage yield of the oil was 0.078% while the anti-microbial test was performed using the five (5) selected bacteria. The essential oil was not able to inhibit the growth of any of the microbes at the (0.2ml) used concentration, indicating that the essential oil of the *Senna occidentalis* does not have any anti-microbial activity at the concentration used. This result is in agreement with Ehssan et al., (2012) work which specified that the application of *Senna occidentalis* on *Escherichia coli* showed no inhibition.

Table 2 further shows the antimicrobial activity of control antibiotic on some selected micro-organisms. The result revealed that out of the ten (10) control antibiotics used; only two (2) Ciprofloxacin and Ofloxacin inhibited all the microbes. This result conformed with Khardori *et al., (*1994*);* Jacobs, (1995)*;* Sanchez-Carrillo *et al.*, (1996) and Watt, *(*1997) findings that ofloxacin, and ciprofloxacin inhibited mycobacterial species.

Vachera et al., (1999) also worked on Comparative antimycobacterial activities of ofloxacin, ciprofloxacin and grepafloxacin and their finding showed that different mycobacterial species showed different degrees of susceptibility to ofloxacin and ciprofloxacin. This implies that Ciprofloxacin and Ofloxacin can be used as an anti-biotic to control the microbes.

CONCLUSION

In conclusion, the percentage yield was 0.078% and the anti-microbial test showed that there is no inhibition of any growth on the microbes at the used concentration. Further investigation showed that two (Ciproflaxocin and Oflaxocin) of the entire antibiotics used as control inhibited the growth of the microbes. However, some microorganism that *Senna occidentalis* did not inhibit shown to be cured by Ciproflaxocin and Oflaxocin antibiotics. Based on the findings of the result, it was recommended that the same oil can be tested for either fungi activities or other bacterial that are not used in this study.

REFERENCES

Aromacaring, (2004): Using essential oils with vulnerable people. Aromacaring Publications.http://wwwaromacaring.co.uk/essential_oils_with_vulnerable_p.hm.

Barbosa-Ferreira M, Dagli M.L, Maiorka P.C, Gorniak S.L, (2005): Sub acute intoxication by senna occidentalis seeds in rats. Food chem Toxicol. 43:497-503 Pubmed.

Ehssan H.O. Moglad, Muddathir S. Alhassan, W.S. Koko and A.M. Saadabi, 2012. *In vitro* Antimicrobial Activity of Sudanese Medicinal Plants. *Journal of Medical Sciences, 12: 219-223.*

Ibrahim M.A, Aliyu A.B, Sallau A.B, Bashir M, Yunusa I, and Umar T.S, (2010): Senna occidentalis leaf extract possesses panosomal activity and ameliorates the trypanosome-induced anemia and organ damage. Pharmacognosy research 2(3): 175-180.

ISOTC (2006): Business Plan on Essential oils (http://isotc.Iso.Org/live link/971087/ISO-TC-Essential- oils pdf) Retrieved on 2012-09-14. It is unclear from the source what period of time the quoted figures include:

Feng PC, Haynes LJ, Magnus KE, Plummer JR and Sherratt HAS.(1962): Pharmacological Screening of some West Indian Medicinal Plants. *J pharmacol.* 14: 556-561.

Hussain HSN and Deeni YY, (1991): Plants in Kano ethnomedicine screening for antimicrobial activity and alkaloids. *International Journal of Pharmacognosy*, 29(1):51-56.

Jacobs, M. R. (*1995*). Activity of quinolones against mycobacteria. *Drugs 49 Suppl. 2*:*67*–75.

Jafri MA, Subhani M, Javed K, Singh S.(1999): Hepatoprotective activity of leaves of cassia occidentalis against drugs and ethylalcohol intoxication in rat *j. Ethnopharmacol*. 66 (3): 355-361.

Khardori, N., Nguyen, H., Rosenbaum, B., Rolston, K.& Bodey, G. P. (*1994*). In vitro susceptibilities of rapidly growing mycobacteria to newer antimicrobial agents. *Antimicrobial Agents and Chemotherapy* 38*,* 134*–7.*

Luckow`, M. (1996): The cultivated species of cassia senna and chamaecrista (Leguminosae) Baileya 23: 2226-2227.

M. Mizanur Rahman,Taslima Sultana,M. Yousuf Ali, M. Masidur Rahman,Sharif M. Al-Reza, and Atiqur Rahman.,(2013):Chemical composition and antibacterial activity of the essential oil and various extracts from *Cassia sophera* L. against*Bacillus* sp. from soil,. *Arabian Journal of Chemistry***.**

National Committee for Clinical Laboratory Standards (NCCLS). 2002. Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria that Grow Aerobically; Approved Standard. National Committee for Clinical Laboratory Standards, Wayne, Pennsylvania, USA.

Nychas, G.J.E., Tassou, C.C. and P. Skandamis, P; (2003):Antimicrobials from herbs and spicesS.m. Roller (Ed.), Natural Antimicrobials for the Minimal Processing Offoods, Woodhead Publishers, CRC Press, New York (2003), 176–200.

Sanchez-Carrillo, C., Cotarelo, M., Cercenado, E., Vicente, T., Blasquez, R. & Bouza, E. (*1996*). Comparative in-vitro activity of sparfloxacin and eight other antimicrobial agents against clinical isolates of non-tuberculous mycobacteria. *Journal of Antimicrobial Chemotherapy* 37*,* 151*–4.*

Silva TC, Gormiak SL, Olaris SC, Raspantimi PC, Haraquchim and Dasliml (2003):Effect of senna occidentalis on chick bursa of fabricius.*Avian pathol*32 (6):633-700. National center for biotechnology information, US, National Library of medicine 8600 Rockville pike, Bethesda MD, 20894 USA.

Smith, Nicholas M. (2002). Weeds of the wet/dry tropics of Australia- a field guide. Environment centre NT, Inc. pp. 112

Stone, Pierce and Andrea; (1970): The American pharmaceutical Association practical Guide to Natural medicines. Pp311.

Vachera. S, Pellegrina, J.L, Leblancb, F, Fourchea, J. and Maugeina, J, (1999). Comparative antimycobacterial activities of ofloxacin, ciprofloxacin and grepafloxacin *Journal of Antimicrobial Chemotherapy*. 44(5): 647-652.

Villa Senor, Jose L and Espinosa-Garcia F. J (2004): The alien flowering plants of Mexico, Diversity and Distributions. 10: 113-123.

Watt, B. (*1997*). In-vitro sensitivities and treatment of less common mycobacteria. *Journal of Antimicrobial Chemotherapy*. *39:567*–74*.*