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Chemical Analysis of an Isolated Potentially Medicinal Active Ingredient of *Sida Acuta* Plant

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Abstract - Sida acuta plant popularly known as stubborn weed is a malvaceous weed that is found virtually everywhere. The research work was aimed at investigating the most probable drying technique for adequate extraction of medicinal active ingredients of sida acuta plant. The study was an observational experimental design, where the method described by Association of Analytical Chemist (AOAC, 2005) was used for the determination of the Phytochemical composition, while instrumentation (pH meter and polarimeter) was used for the pH, optical activity and specific rotation determination. The proximate composition was generally low with the exception of total carbohydrate, while the presence of cryptolepine and scopoletin which are of high medicinal value in the treatment of various ailments was inferred, comparatively it was observed that for each of the plant parts in comparison with chloroquine phosphate and anti-histamine standards, WPOD and LsOD share similar chemical properties, required in the treatment of various ailments. Hence, Sida acuta plant is of great medicinal value

K***ey Words: Acuta, Comparative, Isolation, Phytochemical, Qualitative, Sida Quantitative.***

1. Introduction

Sida acuta is a malvaceous weed, an erect, branched, small perennial herb. It grows on farmlands, pastures, roadsides and waste areas (Mann et al., 2003). The plant is native to Mexico and Central America but has spread throughout the tropics and subtropics (Holm et al., 1977). In traditional medicine, the plant is often assumed to treat diseases such as fever, headache, skin diseases, diarrhoea, and dysentery. Referring to the traditional knowledge, studies have been carried out to confirm the activities of the plant through exert in vivo (Wendyam et al., 2007).

Sida acuta is found in the southern part of Nigeria where it is of highly medicinal importance where a poultice of the leaves is used as an anti – inflammatory agent in the treatment of boils. The leaves and stem are used for the treatment of many ailment including fever, aches and pains, inflammation, worm infestation, ulcer and gastro intestinal disorders. It is also used by traditional birth attendants (TBAS) to quicken delivery (Oboh et al., 2005).

Sida acuta Burm. (Family Malvaceae) is a small herb which is widely distributed in hotter parts of India where it is used in the treatment of many ailment and diseases (Krishnamurthi et al., 1972). Following the traditional usages of the plant, many studied can be conducted in the laboratory for the efficiency of the plant, being a plant of high plasmodia activity due to its alkaloids principally cryptolepine, the main alkaloid of the plant and the plant act as anti-bacteria on many other compounds which have interesting pharmacological properties and could also be isolated and quantified from the plant. In addition, the plant also have other properties being a medicinal plant with numerous

potentialities for all desired pharmacological activities, for the sake of this study, cryptolepine and scopolepine and various alkaloids and steroidal compounds would be extracted and chemically examined.

The sporadic explosion of deadly morbidity in the developing nations necessitate quick attention which can easily be achived by diversification to natural products. The study aimed at isolate the medicinal potentiality of the sida acuta plant, and investigates the most probable drying technique for adequate extraction of the active ingredients of the plant.

2. Materials and Methodology

2.1 Sample Collection and Preparation

The whole plant of Sida acuta Burm (S.A) malvaceae were colleted from Araromi area in Ede metropolis and the voucher specimen was deposited in chemistry laboratory of the institution.

2.2 Sample Treatment

The plant materials were washed and drained, then divided into four different parts as; whole plant(WP), leaves (Ls), stems (Ss), and roots(Rs) subjected to the following drying techniques that is; air drying, sun drying and oven drying resulted into twelve different samples of which eight samples were technically available for the period of the research work which are; Whole plant oven dried (WPOD), leaves oven dried (LsOD), stems oven dried (SsOD), roots oven dried (RsOD); whole plant sun dried (WPSD), leaves sun dried (LsSD), stems sun dried (SsSD) and roots sun dried (RsSD). This is because the time frame could not accommodate air dried samples due to high moisture content of the plant.

2.3 Methodology

The Research was Experimental Observational Study Design. The method described by Association of Analytical Chemist (AOAC, 2005) was used for the determination of the Phytochemical composition: Moisture, Ash, Crude Fat, Crude Fibre, Crude Protein, Total Carbohydrate,, Partition Coefficient, Solubility, Isolation of Cryptolepine (5-Methylindolo (2,3b)-Quinoline), Scopoletine (6-methoxyl-7-hydroxycoumarin), Anti-Ulcer Extract, medicinal alkaloid and Anti-Histamine contents. While instrumentation (pH meter and polarimeter) was used for the pH, optical activity and specific rotation determination.

3. Results

3.1 Phytochemical Analysis

Table 1.The proximate contents of the plant

Sample	% moisture content	% ash content	%crude fat content	%crude fibre	%crude protein	%total carbohydrate
WpOD	40.50+ 0.3	4.15+ 0.3	1.00+ 0.3	0.72+ 0.2	3.09+ 0.3	15.68+0.02
LsOD	32.50+ 0.3	1.25+ 0.3	1.50+ 0.3	1.15+ 0.2	4.05 + 0.3	15.66+ 0.02
SsOD	25.02+ 0.3	2.11+ 0.3	0.67+ 0.3	0.52+ 0.2	3.72+ 0.2	14.63+ 0.02
RsOD	35.60+ 0.3	2.25+ 0.3	0.00+ 0.3	0.02+ 0.2	2.44+ 0.2	15.83+ 0.02
WPSD	42,20+ 0.3	4.50+ 0.3	0.20+ 0.3	0.32+ 0.2	8.42+ 0.2	18.62+ 0.02
LsSD	38.50+ 0.3	1.50+ 0.3	0.40+ 0.3	0.42+ 0.2	6.71+ 0.2	16.77+ 0.02
SsSD	32.30+ 0.3	2.50+ 0.3	0.00+ 0.3	0.02+ 0.2	4.87+ 0.2	15.55+ 0.02
RsSD	40.50+ 0.3	2.90+ 0.3	0.00+ 0.3	0.12+ 0.2	3.90+ 0.2	16.76+ 0.02

3.2 Qualitative Analytical Test

Table 2: Identification of cryptolepine, scopoletin and medicinal alkaloid

Samples	Cryptolepine content	Scopoletin content	Medicinal alkaloid content
WpOD	Present	Present	Present
LsOD	Present	Present	Present
SsOD	Present	Present	Present
RsOD	Absent	Absent	Absent
WPSD	Present	Present	Present
LsSD	Sparingly observed	Present	Present
SsSD	Absent	Absent	Absent
RsSD	Absent	Absent	Absent

3.3 Comparative Analysis

Table 3: Comparative analysis of chroloquine phosphate with anti-malaria extracts

Anti-malaria	pH	P	Solubility g/cm3	(α) 250C D
Chloroquine phosphate	8.5	1.97	1.0	-2.9
WPOD Anti-malaria extract	7.9	1.04	0.8	-1.1
LsOD Anti-malaria Extract	7.1	1.75	0.9	-1.2
SsOD Anti malaria Extract	7.2	0.97	0.2	-0.9
RsOD Anti malaria Extract	7.15	0.65	Insoluble	Official inactive
WPSD Anti malaria Extract	9.5	0.75	0.5	-1.0
LsSD Anti malaria Extract	8.9	0.9	0.4	-1.25
SsSD Anti malaria Extract	9.7	0.5	Insoluble	Optically inactive
RsSD Anti malaria Extract	7.5	0.2	Insoluble	Optically inactive

Table 4: Comparative analysis of anti-histamme with the anti-ulcer extract.

Anti-malaria	pH	P	Solubility g/cm3	(α) 250C D
Anti-Histamine	8.4	2.01	0.96	+2.240
WPOD extract	7.5	2.98	0.73	-2.10
LsOD Extract	7.9	1.72	0.81	-1.50
SsOD Extract	7.2	1.30	0.68	-2.80
RsOD Extract	6.3	0.98	0.60	-5.20
WPSD Extract	6.7	1.21	0.64	-2.80
LsSD Extract	6.8	1.01	0.69	-1.940
SsSD Extract	5.9	0.77	0.58	-4.10
RsSD Extract	5.7	0.75	0.27	-7.10

Key: WPOD- Whole Plant Oven Dried, LsOD – Leaves Oven Dried
SsOD – Stems Oven Dried, RsOD – Roots Oven Dried
WPSD – Whole Plant Sun Dried, LsSD – Leaves Sun Dried
SsSD – Stems Sun Dried, RsSD – Roots Sun Dried

4. Discussions

The results of this research work could be discussed under the following headings:

4.1 Quantitative Analysis

Table 1 showed that Sida acuta plant contained high moisture (40.50%+ 0.3 - 25.02%+ 0.3), hence restricted the samples to oven and sun drying techniques because of the time frame. This table also revealed that the ash content of Sida acuta plant was at a bearable level (4.15%+ 0.3 - 1.25%+ 0.3) as an anti-nutritive factor in the plant, in concordance with (Adams M, etaal, 2006).The same table showed that the crude fat content of LsOD, WPOD, SsOD and RsOD (1.00%, 1.50%, 0.67%, and 0.00%), was higher than the the sun dried plant's parts samples. This may be due to the photo-degradation of fatty acid arising from the absorption of infra-red from sunlight by each of WPSD, LsSD, and SsSD samples, resulted into their lower fat content. That is the leaves of Sida acuta was the major source of crude fat in the plant and should be taken in controlled amount to avoid obesity and high blood pressure. As it was reported in (NDHS, 2010). The total carbohydrate was high (18.62%+ 0.02 - 14.63%+ 0.02), While the crude fibre, and crude protein were low when compare to other plants (Anani K, eta al, 2000)

4.2 Qualitative Analysis

Table 2 showed that cryptolepine (5-methylindolo (2,3b) – quinoline) being a very important natural alkaloid was mainly observed in WPOD, LsOD, SsOD and LsSD but absent from SsSD, RsOD and RsSD. Likened to be due to photo-degradation of alkaloidal substances in SsSD sample (Yang JY, etal, 2007). This table also showed that scopoletin (6-methoxyl-7-hydeoxycoumarin) being a coumarin that has been isolated from many plants species was also confirmed to share similar trend with that of cryptolepine (Adams M, etaal, 2006).While the same table inferred the presence of medicinal alkaloid in WPOD, LSOD, SSOD, WPSD, and LSSD samples in which there was none in RSOD, SSSD and RSSD in cocordance with the work of (Yang JY, etaal 2007).

4.3 Comparative Quantitative Analysis

Table 3 showed that using chloroquine phosphate as a reference standard, having a PH (1gmt-1) 8.5, partition coefficient of 1.97 aqueous solubility of 1.gm1-1 and a specific rotation of -2.40.

WPOD samples extract with a PH 7.9 showed that its antimalalria effect on the host tissue will be favoured in the blood, having almost a neutral PH will enhance its existence as unionised fraction much more than the reference standard. From its partition coefficient and aqueous solubility showed that the extracts would be soluble in both the polar (plasma) and non-polar-fluids of the body which will enable it to reach its site of action to exhibit its biological activities (). It was also observed to have a moderate partition coefficient "p" which allow its passage through various organs and membrane, while its specific rotation will make the extracts to be biologically activitive when compared with the standard which was a levoratatory isomers (Yang JY, etal, 2007).

Table 4 showed that, using antihistamine as a reference standard having a PH (1gml-1) 8.4, partition coefficient of 2.01, aqueous solubility of 0.96gml-1 and specific rotation of +2.22o. gastric ulcer being a metabolic disease which can be cured with a pharmacodynamic agent, its biological effect would not depend so much on the specific rotation, and partition coefficient, but will rather depend slightly on the pH whereas only weakly acidic drugs will exist in the stomach in unionized forms in which only RsOD, WPSD, LsSD, SsSD, and RsSD extracts will be suitable for the treatment of gastric ulcer (WHO, 2015).

5. Conclusion

Chemical analysis of the isolated active ingredient of Sida acuta plant, revealed that the plant though common but not widely identified as a medicinal plant. It could therefore be confirmed to be medically active in the treatment of malaria, ulcer and many other infectious diseases. However, the outcome of this

study, showed that the oven dried samples of Sida acuta (LSOD) was found to show promising results, and of immense potential for further research and development in the treatment of ailments.

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