ECOLOGICAL ANALYSIS OF THE PHYTOCHEMICALS IN FLOWERS AND LEAVES OF *Calotropis procera* (R. Br.) IN SOME STATES OF NIGERIA

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ABSTRACT

Calotropis procera plant is popularly known because it produces large quantity of thick white milky juice when cut or break. Plant derived substances have obtained greater attention in the recent years which are used to prevent and cure human diseases as they are considered to be more bio friendly worldwide. An ecological study has been carried out on Comparative analysis of the phytochemicals *C. procera,* between Ilorin and Gombe metropolises. Some matured freshly parts flower and leaves of the plant were randomly collected from the two metropolises, the collected parts were dried under shade and was pulverised into coarse powder using mortar and pestle. Each powdered plant parts were extracted using water, methanol and ethanol as extractants. The crude extracts of flowers and leaves was screened for the phytochemicals, which revealed the presences of the following phytochemical, saponins, tannin, alkaloids, flavonoids, steroids, terpenoids, and glycosides in both plant parts with variations. The phytochemicals are moderately correlated and statistically significant at (α = 0.05) and (α = 0.01). Also, when the phytochemicals were compered between the two metropolises. The results shows were significantly difference at (α = 0.05). For the flowers, and leaves (0.850, 0.080) between the two metropolises respectively. The variation observed in the occurrence of the phytochemical in studied parts between the two metropolises may be attributed to the age of the plant, solubility of the solvents into solution of specific type and soil types in the study area. The ethno botanical information collected on the uses of *C. procera* revealed that the plant is commonly used in making local cheese (wara) as food, its medicinal, firewood, and as fodder for animals.

Keyword: Ecology, Extracts, Ethno-Botany, Phytochemicals, Solubility, Variability.

INTRODUCTION

Plant derived substances have obtained greater attention in the recent years which are used to prevent and cure human diseases as they are considered to be more bio friendly worldwide (Goyal *et. al.* 2011). Also, according to (Okoli *et. al.* 2007), traditional society in Africa has always used herbs to promote healing which is an alternate means in treating human diseases (Alam 2009). *Calotropis procera* plant is popularly known because it produces large quantity of thick white milky juice when cut or break (Goyal *et. al*. 2011). Morphologically, its multi branched,

perennial shrub with yellowish bark, soft and corky tissues. (Orwa *et. al.* 2009). Matured fruits erupt to disperse seeds which are widely spread by wind and animals (Parsons and Cuthbertson, 2001). It's a plant of dry savannah and other arid areas (Aliyu 2006). It is used as fuel wood and considered as obnoxious poisonous shrub but is also purposefully cultivated in India for traditional medicinal uses and as an alternative source of energy (Kabir, and Khan. 2003). The species has a robust root system that may reach a depth from 1.7 m to 3.0 m in sandy desert soils. (Barbosa, *et al.*, 2007). After pruning, new branches are quickly formed. (Colombo, *et al.*, 2007).

The abundance of plants on earth's surfaces has led to an increasing interest in the investigation of different extracts obtained from traditional medicinal plants as potential sources of new antimicrobial agents (Bonjar. *et al.,* 2004). Plant flowers, fruits and seeds exudates secondary metabolites richly. Therefore, the useful products obtained from plants directly or indirectly, demonstrate their importance to man. Two species represent this genus they are *C. gigantea* and *C. procera*. Main difference between the two is that *C. gigantea* has white flowers, while *C. procera* has pinkish white flowers (Noatay 2005). Different parts of *C. procera* have been reported to exhibit ethno medicinal and nutritional properties. This study was conducted in order to investigate effects of ecological types on the composition of Phychemicals in *C. procera* and its enthnobotanical used between the two metropolises.

MATERIALS AND METHODS

Plant Collections, Identification and Preparation

The flowers and leaves of a matured fresh plant of *C. procera* were collected by carefully hand-picked of the flowers and leaves on the plant at Road Transport Ero'omo Park along Murtala Mohammed road Offa Garage (Ilorin East) and also at the premises of JADES Ventures Ltd near Kwara State Television, Apata Yakuba old Jebba Road (Ilorin West) which are on Latitude and longitude 8º49 N, 4º65 E respectively within Ilorin metropolis. Likewise, same parts of this plant were also collected at Liji along Maiduguri express Road (Gombe East) and old mile 3 opposite Jiyamere Hotel alongside main Bauchi Gombe express Road, (Gombe West) on latitude and longitude, 10º15 N, 11º10 E respectively within Gombe metropolis. The freshly collected plant samples and pictures were taken to the University of Ilorin for identification, they were confirmed and authenticated at the herbarium of the Department of Plant Biology University of Ilorin, Kwara State.

Enough flowers and leaves of a matured *C. procera* plants without physical signs of predation or pathogen attack were selected at random and collected. Samples collection was done during Raining Season May - July at the early hours of 7:20 – 10:20am morning. Flowers and leaves collected were washed with distilled water in the laboratory to remove impurities and dried under shade, samples were then pulverized into coarse powder using mortar and pestle. The powdered samples were sieved and stored in an airtight container of

capacity 1000 mL for two days before subjecting for the Phytochemicals analysis.

Phytochemical Analysis

The phytochemicals extraction was carried out in the Biochemistry laboratory Gombe State University. 10 g of pulverized flowers was weighed on an electrical balance with model number aeADAM RS-232. Soxhlet extractor (continuous hot extraction) was used. The pulverized (powdered) flowers powder was taken in a thimble which was placed in a soxhlet extractor. The extractor containing the thimble and the flowers powder was filled on top of the round bottom flask 500 mL and placed on the heating mantle. A condenser was fitted at the top of the extractor and a 99% concentration for each of methanol and ethanol was used, out of which 250 mL for each were measured and poured into the flask on the heating mantle. On heating, the solvent of (methanol and ethanol) evaporated to the condenser, where it condensed and trickled (drained) back to the extractor holding the thimble full with the plant material. The extractor became full with the hot solvent it siphoned down to the flask along with the constituents. The recycling of the evaporated solvent was allowed until the extraction was completed. The extracts, was then poured into a different volumetric flask appropriately labelled and stored at room temperature before analysis. Same procedure was repeated for leaves, using methods of extraction described by Vishwa (2014). A cold extraction of the flowers and leaves in water was performed where the samples were soaked in water for seven days after which the mixture was filtered with No. 1 filter paper, the extracts were also poured into a different volumetric flask appropriately labelled and stored at room temperature before analysis. Alkaloid, flavonoid, saponin, steroid, glycosides, tannin and terpenoid were determined as described by Sopowora (1993).

Collection of Ethnobotanical Information

For collection of ethnobotanical information, the procedures of Cunningham (2001) was employed. The research was conducted in two phases. In first phase household surveys were conducted in 3 selected Gombe and Ilorin villages. The selection of the household was done at random where ten houses were counted and the eleven one picked as one, until ten household were selected. Only the male heads of the families were interviewed in the 10 households. The respondents included city dwellers, village farmers and Cattle rearers. The ages of respondents were from 35 to 60 years. In the second phase, local medicinal plant experts were selected by adopting method of Azhar *et al.* (2014) and individual interviews were conducted with 10 medicinal plant experts. A questionnaire was used which entailed major ethno botanical usage like common use, medicinal use and other modes of plant use.

Statistical Analysis

The occurrence of phytochemicals was analysed. The qualitative data obtained were transformed to quantitative data by coding as, +++ represent 3.0, ++ represent 2.0, + represent 1.0 and finally – represent 0.0 for the purpose of statistical analysis. A correlation matrix was used to find out the correlation among the phytochemicals in

the plant parts. Level of significance were denoted at $p \leq 0.01$ and $p \leq 0.05$. And then finally, the samples from the two metropolises were compared using a paired t – test.

RESULTS

Table 1 shows the results of phytochemical screening of flowers collected from *C. procera* plant in Ilorin and Gombe metropolises. In Ilorin metropolis, water crude extracts were found to be high and moderately presence detection of the phytochemicals with some traces of phytochemicals in Ilorin East compared to Ilorin West, where a non-detection of steroids, tannins and terpenoids were observed. Conversely, the methanol crude extract for phytochemicals shows a similar trend except for the non-detection of tannins and glycosides at Ilorin East and West respectively. Moreover, the crude extracts of ethanol were found to be similar except for the non-detection of flavonoids and tannins in Ilorin East and as well as steroids, tannins and terpenoids in Ilorin West.

Water crude extract was found to be moderate in detection of the phytochemicals in Gombe west compared to Gombe East which revealed traces detection of phytochemicals and absent in flavonoids at Gombe East. Similarly, methanol crude extract shows a similar trend with moderate and traces detection of phytochemicals and absent of tannins in Gombe East and as well as steroids, tannins and terpenoids in Gombe West respectively. Also, ethanol crude extract shows different trend with a highly presence detection of phytochemicals in Gombe West compared to Gombe East with moderate and some traces detection of phytochemicals, a non-detection of flavonoids in East and as well as steroids, tannins and terpenoids in West were observed. The comparison between the two metropolises revealed that there is significant difference in the solubility affinity of the extractants used within the metropolises.

Table1: Phytochemical screening of flowers of *Calotropis procera* in Ilorin and Gombe metropolises

Phytochemicals	**Solvents /Extractants**											
	Water/Location				Methanol/Location				Ethanol/Location			
	IL-EST	IL-WS	GM-EST	GM-WS	IL-EST	IL-WS	GM-EST	GM-WS	IL-EST	IL-WS	GM-EST	GM-WS
Alkaloids	++	+++	+	+++	+	+	++	++	+++	++	+++	++
Flavonoids	+	++	-	++	++	++	+	+	-	+	-	+
Saponins	+++	++	+	++	+++	+++	++	+++	+++	+++	+++	+++
Steroids	++	++	+	++	+	+	+	-	++	-	++	-
Glycosides	++	+	+++	++	+	-	++	+	++	++	++	++
Tannins	+	-	+	++	-	+	-	-	-	-	++	-
Terpenoids	++	-	+	++	+	+	+	-	+	-	++	-

Key: IL-EST = Ilorin East, IL-WS= Ilorin West, GM-EST=Gombe East, GM-WS= Gombe West, +++ = highly present, ++ = moderately present, + = traces, - = not present

Table 2 shows the qualitative results of phytochemicals screening of leaves collected from Ilorin and Gombe metropolises. In Ilorin metropolis, water

crude extract was found to be highly presence of phytochemicals with some trace of the phytochemicals in Ilorin East and Ilorin West, where flavonoids were not detected in Ilorin East and steroids, terpenoids in Ilorin West respectively. Similarly, for methanol crude extract it shows a similar pattern in detection of phytochemicals except a non-detection of flavonoids and tannins at Ilorin East and West respectively. Conversely, ethanol crude extract was found to be different in detection of phytochemicals with highly detection of phytochemicals and some traces, but a non-detection of steroids, terpenoids in Ilorin East and flavonoids, steroids and terpenoids in Ilorin West.

In Gombe metropolis, water crude extract was found to be moderate with some trace's detection of phytochemicals at Gombe West and East respectively but glycosides and tannin were absent in Gombe West. Similarly, methanol as an extractants shows a similar trend with highly detection of phytochemicals and some traces. A non-detection of saponins, tannins in Gombe East and as well as steroids, tannins and terpenoids in Gombe West were observed. Ethanol crude extract shows a different trend with moderate detection of phytochemicals in Gombe West compared to Gombe East with moderately and some traces detection of phytochemicals but it was absent in steroids and terpenoids in both locations. The comparison results between the two metropolises revealed that there is a significant difference in the solubility affinity of the extractants used within the metropolises.

Table 2: Phytochemical screening of leaves of *Calotropis procera* in Ilorin and Gombe metropolises

Phytochemicals	**Solvents /Extractants**											
	Water/Location				Methanol/Location				Ethanol/Location			
	IL-EST	IL-WS	GM-EST	GM-WS	IL-EST	IL-WS	GM-EST	GM-WS	IL-EST	IL-WS	GM-EST	GM-WS
Alkaloids	+++	+	++	++	+++	+++	+++	++	+++	+	+++	+++
Flavonoids	-	+	+	+	-	+	+	+	++	-	++	++
Saponins	+++	++	+++	+++	+++	++	+	+++	+++	+++	+++	+
Steroids	+++	-	+	+	++	+	+	-	-	-	-	-
Glycosides	++	++	+++	-	+++	+	+	++	++	+	++	+
Tannins	+++	+++	++	-	+++	-	-	-	+++	+++	+++	++
Terpenoids	+++	-	+	+	++	+	+	-	-	-	-	-

Key: IL-EST = Ilorin East, IL-WS= Ilorin West, GM-EST=Gombe East, GM-WS= Gombe West, +++ = highly present, ++ = moderately present, + = traces, - = not present

Table 3 Correlation coefficient matrix of phytochemical screening of flowers of *C. procera* in Ilorin and Gombe metropolises. The table showed that there is a positive and statistical significance ($P < 0.05$) between phytochemicals for extracts of water in Gombe West with that of water extract from Ilorin West. However, the presence of phytochemicals in extracts of methanol from Ilorin East location was found to be

negatively related and none statistically significant with that of Gombe East. This invariably means that there is an inverse relationship. Moreover, there exists positive and significant relationship ($P < 0.05$) between the phytochemicals of *C. procera* flower in methanol extract at Ilorin West with that of Ilorin East location. Similarly, the results further revealed that phytochemicals found in methanol extracts from Gombe West found to be positive (0.759, 0.764, and 0.832,) and statistically significant ($P < 0.05$) with that of methanol extracts from Ilorin East, Gombe East and water extract from Ilorin West respectively. The table further revealed that the presence of phytochemicals in the flowers of *C. procera* for ethanol extract from Ilorin East was found to be positively related and statistically significant ($P < 0.05$) to that of water extract in Ilorin East and methanol extract from Gombe East location. Also, the presence of phytochemicals in ethanol extract from Ilorin West location was found to be positively related 0.950 and statistically significant ($P < 0.01$) to that from Gombe West. A Similar result was found between the Ilorin West location and that of Gombe East in terms of the presence of phytochemicals in water and methanol extract respectively. The presence of phytochemicals in ethanol extract from Gombe East location was found to be positively related (0.786) and statistically significant at ($P < 0.05$) with that of Ilorin East. Finally, the table revealed that the presence of phytochemicals in flowers *C. procera* from Gombe West for ethanol extract was found to be positively related (0.855, 0.950, 0.774 and 1.00) and statistically significant ($P < 0.05$ and $P < 0.01$) with that of Gombe East and West in methanol extract.

Table 3: Correlation of *Calotropis procera* flowers

	IL E. Water	ILW. Water	GM E. Water	GM W. Water	IL E. Methanol	ILW. Methanol	GM E. Methanol	GM W. Methanol	ILE. Ethanol	ILW. Ethanol	GME. Ethanol	GMW. Ethanol
IL E. Water	1											
ILW. Water	.227	1										
	.624											
GM E.	.307	-.174	1									
Water	.503	.709										
GM W.	-.091	.778*	-.420	1								
Water	.846	.040	.348									
IL E.	.580	.536	-.250	.132	1							
Methanol	.172	.215	.588	.777								
ILW.	.326	.391	-.640	.364	.816*	1						
Methanol	.475	.385	.122	.422	.025							
GM E.	.730	.674	.420	.167	.563	.099	1					
Methanol	.062	.097	.348	.721	.188	.832						
GM W.	.627	.832*	0.000	.573	.759*	.607	.764*	1				
Methanol	.131	.020	1.000	.179	.048	.148	.046					
ILE. Ethanol	.868*	.477	.354	.198	.393	.118	.842*	.681	1			
	.011	.279	.437	.670	.383	.801	.018	.092				
ILW.	.625	.774*	.283	.415	.680	.391	.855*	.950**	.693	1		
Ethanol	.134	.041	.538	.355	.093	.385	.014	.001	.084			
GME.	.725	.137	.370	.220	0.000	0.000	.441	.433	.786*	.412	1	
Ethanol	.065	.769	.413	.635	1.000	1.000	.322	.332	.036	.359		
GMW.	.625	.774*	.283	.415	.680	.391	.855*	.950**	.693	1.000**	.412	1
Ethanol	.134	.041	.538	.355	.093	.385	.014	.001	.084	0.000	.359	

Key: person correlation coefficient matrix. NOTE, *Correlation is significant at the 0.05, **Correlation is significant at the 0.01, IL E = Ilorin east, IL W. = Ilorin west, GM E. = Gombe east, GM W. = Gombe west.

Table 4 showed that there is positive and statistical significance ($P < 0.05$) between phytochemicals in water extracts at Gombe West with that of water extract from Ilorin West. However, the presence of phytochemicals in water extracts from Gombe West was found to be negatively related and statistically not significant with that of Ilorin West. This invariably means that there is an inverse relationship. Moreover, there exists positive and significant relationship ($P < 0.05$) between active compounds of *C. procera* leaves in methanol extract at Ilorin East with that of water extract from Ilorin East. In the same trend, the results further revealed that phytochemicals of methanol extracts from Ilorin West was found to be positive (0.773) and statistically significant ($P < 0.05$) with that of water extracts from Gombe West. However, the phytochemicals in methanol extracts from Gombe East was found to be negatively related and statistically not significant with that of Ilorin West and Gombe East in water extract. This invariably means there is an inverse relationship in the phytochemicals

The table further revealed that the presence of phytochemicals in leaves of *C. procera* extracted with methanol from Gombe West was found to be positively related (0.841) and statistically significant ($P < 0.05$) with that of water extract in Gombe East. A Similar results of phytochemicals presence in ethanol extract from Ilorin East location was found to be positively related (0.846) and statistically significant ($P < 0.05$) to that from Ilorin West water extract. The phytochemicals in ethanol extract from Ilorin West was found to be positively related (0.767 and 0.834) and statistically significant at ($P < 0.05$) with that of Ilorin West and East of water and ethanol extract respectively. Likewise, it is revealed that phytochemicals presence in ethanol extract from Gombe East was found to be positively related (0.846, 1.000 and 0.834) and statistically significant ($P < 0.05$ and 0.01) with that of ethanol extract in Ilorin East and West, and water extract in Ilorin West accordingly. Finally, the table showed that the presence of phytochemicals in the leaves of *C. procera* from Gombe West in ethanol extract was found to be positively related and statistically significant with that of Ilorin West and Gombe East extract of ethanol.

Table 5 compared the phytochemicals of *C. procera* leaves between Ilorin and Gombe metropolises. The t-test results for the leaves, revealed the mean values as (1.7143) and (1.3810) and the mean difference of (0.70821) between the different locations, with the t-value of (1.796) and p-value of (0.080) indicating that there is significant difference in the presences of these phytochemicals in leaves of *C. procera* between the two metropolises at alpha ($\alpha = 0.05$) level of probability.

Likewise, the results for the phytochemicals in flowers, revealed the mean values to be (1.3571) and (1.3810) and the mean difference is (0.22896) between the two metropolises at different locations, with t-value (0.190) and p-value as (0.850) which shows that there is significant difference in the occurrence of these phytochemicals in flowers of *C. procera* between the two metropolises at alpha ($\alpha = 0.05$) level of probability.

Table 4: Correlations of *Calotropis procera* leaves

	IL E. Water	ILW. Water	GM E. Water	GM W. Water	IL E. Methanol	ILW. Methanol	GM E. Methanol	GM W. Methanol	ILE. Ethanol	ILW. Ethanol	GME. Ethanol	GMW. Ethanol
IL E. Water	1											
ILW. Water	-.070	1										
	.881											
GM E.	.233	.853*	1									
Water	.615	.015										
GM W.	.216	-.025	.198	1								
Water	.642	.958	.670									
IL E.	.811*	.452	.713	.100	1							
Methanol	.027	.309	.072	.831								
ILW.	.177	-.056	.250	.773*	.225	1						
Methanol	.705	.906	.588	.042	.628							
GM E.	0.000	-.370	-.185	.156	0.000	.701	1					
Methanol	1.000	.413	.691	.739	1.000	.079						
GM W.	.108	.678	.841*	.571	.482	.564	0.000	1				
Methanol	.818	.094	.018	.181	.273	.187	1.000					
ILE.	-.062	.846*	.669	.248	.366	.298	0.000	.689	1			
Ethanol	.894	.016	.100	.591	.420	.517	1.000	.087				
ILW.	.441	.767*	.709	.307	.698	.181	-.242	.636	.834*	1		
Ethanol	.322	.044	.074	.504	.081	.697	.602	.124	.020			
GME.	-.062	.846*	.669	.248	.366	.298	0.000	.689	1.000**	.834*	1	
Ethanol	.894	.016	.100	.591	.420	.517	1.000	.087	0.000	.020		
GMW.	-.245	.452	.214	.100	.058	.382	.449	.329	.811*	.481	.811*	1
Ethanol	.596	.309	.645	.831	.902	.397	.312	.471	.027	.275	.027	

Key: person correlation coefficient matrix. NOTE, *Correlation is significant at the 0.05, **Correlation is significant at the 0.01, IL E = Ilorin east, IL W. = Ilorin west, GM E. = Gombe east, GM W. = Gombe west.

Table 5. Paired t-test for leaves and flowers of *C. procera* between the two metropolises

LEAVES	**Mean**	**95% Confidence Interval of the Difference**	**T**	**Df**	**Sig. (2-tailed)**
Kwara	1.7143				
Gombe	1.3810				
Kwara-Gombe		0.70821	1.796	41	0.080
FLOWERS					
Kwara	1.3571				
Gombe	1.3810				
Kwara-Gombe		0.22896	0.190	41	0.850

Table 6 is the common uses of *C. procera* according to different respondents in Gombe and Ilorin metropolises. The results in Gombe villages revealed the different uses of *C. procera* shrub and the common multipurpose uses were divided into six categories i.e., medicinal, fodder, firewood, food, aesthetic and miscellaneous. Local dwellers respondents expressed their opinion about the uses of this plant as; food, fodder, medicinal and firewood 25.80%, 25.80%, 22.58%, and 22.58% respectively. And medicinal plant expert opined to the use of this plant as firewood 24.39%, fodder 21.95%, medicinal 21.95% and food 19.51% and a few of city dwellers responded to this as firewood 31.57% and is medicinal 26.31%.

Also, the results from Ilorin villages revealed a similar trend in the uses of *C. procera* shrub in Ilorin and its environs. Local dweller responded positively to the uses of this as; firewood 23.68%, fodder 21.05%, medicinal 26.31%, and food 18.42%. Likewise, the medicinal plant expert responded in a similar trend that it is as; medicinal 22.72%, fodder 20.45%, food 18.18%, firewood 18.18% and the fruit silk is used in making pillows for neck pain relief. And city dwellers respondents opined to the uses of this plant as medicinal 21.08%, fodder 21.73% and food 30.43%

for animals. For example, * = thatch roof houses, pillows, beds etc.

Table 6: Common uses of *C. procera* according to different respondents in Gombe and Ilorin metropolises.

Plant uses	Citation responses in (%)					
	Gombe			**Ilorin**		
	local dweller's	medicinal plant experts	city dweller's	local dweller's	medicinal plant experts	city dweller's
Firewood	25.80	24.39	31.57	23.68	18.18	17.39
Fodder	25.80	21.95	15.78	21.05	20.45	21.73
Medicinal	22.58	21.95	26.31	26.31	22.72	26.08
Food	22.58	19.51	21.05	18.42	18.18	30.43
Aesthetic	0.0	7.31	5.26	7.89	4.54	4.34
Miscellaneous*	3.22	4.87	0.0	2.63	15.90	0.0

DISCUSSION

The phytochemicals occurrence in the crude extracts of water, methanol and ethanol for flowers and leaves of *C. procera* was screened, the results revealed the presences of alkaloids, flavonoids, saponins, tannin steroids, terpenoids, and glycosides occurring in both selected plant parts (Table 1, 2). This finding was in concord with the work of (Amit *et. al*. 2014, Ghias *et. al*. 2012). Who reported that the plant *C. procera* is a rich source of various chemical constituents like steroids, terpenoids, saponins and glycosides, flavonoids, it was also in agreement with (Jagan *et al*. 2014). Who reported a similar investigation that the various extracts of *C. procera* for phytochemicals analysis were found positive for saponins, flavonoids, tannins, alkaloid and glycosides occurring in these parts of the plant species. Table 3 and 4 Revealed the presences of phytochemicals from the different location in the two metropolises which are moderately correlated and statistically significance at $\alpha = 0.05$ and $\alpha = 0.01$ level. Table 5. Revealed the results for a paired t-test of the phytochemical within and between the metropolises. The plant leaves show a significant difference with t-value as (0.080) between the two metropolises at ($\alpha = 0.05$). Same trends were also observed for flowers sampled between the two metropolises as (0.850). The variations might be as a result of the difference in the age of the plants selected for the study, and also the different in the geographical location, climate and vegetation types of the study area Sudan and Guinea Savannah might be the reasons for these variations. This finding was in agreement with the work of (Ramachandran *et. al.* 1980, Adoum *et. al.* 1997) who reported that the variability observed in the occurrence of the phytochemicals obtained in the present study could be attributed to the variability in geographical location of the plants as well as the part of the plant examined. The common and multipurpose uses of *C. procera* were divided into six categories these are; firewood, fodder, medicinal, food, aesthetic and miscellaneous. The respondents opined to all as medicinal, fodder, miscellaneous, food and firewood used. The respondents responded positively on the use of this plant as fodder, such that

goat do feed on it during dry season, as medicine such as the roots, stems and leaves are processed locally to treat different ailment, as firewood the stems when collected and dried could be an alternative source of firewood to local dwellers. And finally used as food, Fulani used it to coagulate their milk to produce local cheese known as Wara in Yoruba. This was in agreement the reported of (Awune, 2000; Olasupo *et al*., 2004). Different parts of *Calotropis procera* have been reported to exhibit ethno medicinal and nutritional properties.

The traditional plant experts also opined that *C. procera* shrub has great diversity of its medicinal uses and commonly used for a wide range of ailments. Either a part or whole plant is used single or in combination with other plant materials or mineral to enhance its effectiveness and efficacy, This finding was in agreement with (WHO 1991) who defined medicinal plant as 'any plant which has one or more of its organs, contain substances that can be used for therapeutic purposes or which are precursors for synthesis useful drugs. The leaves are used to treat joint pain and reduce swelling. It is also used as a homeopathic medicine (Meena et al 2011). This work was further supported by (Sharma *et al,* 2011). The leaves of *Calotropis procera* are used by various tribes of Central India as a curative agent for jaundice. It is also used by traditional medicine practitioners in Gwari communities of Nigeria for the treatment of ringworms as (Kuta, 2008) reported.

CONCLUSION

The study on the Ecological analysis of the phytochemical presence in flowers and leaves of *Calotropis procera* has been carried out and the results revealed the presences of phytochemicals such as alkaloids, flavonoids, saponins, steroids, glycosides, tannins and terpenoids with significant difference in their occurrence of the studied parts. The ethno botanical information on the use of *Calotropis procera* revealed that it can be used as fodder, medicinal, firewood and food, which makes it an essential plant.

It is therefore, recommended that further research be carried out in order to isolate and purify the phytochemicals constituents of this *C. procera* using different solvent for the extraction techniques, with a view to justify these claims.

REFERENCES

Adoum, O.A., Akinniyi, J.A. and Omar, T. (1997). The effect of geographical location on the antimicrobial activities and trace element concentrations in the root of *Calotropis procera* (Ait.) R. Br, *Annals of Borno*, 13(14): 199-207.

Alam, S. (2009). Antimicrobial activity of natural products from medicinal plants. *Gomal Journal of Medical Sciences* 7(1):72-78.

Aliyu, B.S. (2006). *Common ethno-medicinal plants of the semi-arid regions of West Africa - Theirdescriptions and Phytochemicals* 1:93-94. Triumph Publishing Company Limited, Gidan Sa'adu Zungur, Kano, Nigeria.

Amit, Tiwari., Sanchita. Singh. and Suchita, Singh. (2014). Chemical Analysis of Leaf Extracts of *Calotropis procera*. *International*

Journal of Scientific and Research Publications, Volume 4(1): 1 – 2.

Awune, J.O. (2000). Studies on biofungicidal properties of fresh leaf extracts of *Azadirachta indica, Calotropis procera and Thevetia nerrifolia* using *Aspergillus fumigatus and Aspergillus flavus*. B.Sc. dissertation (unpublished), Ahmadu Bello University,Zaria. 44pp.

Azhar, Farooq M., M. Tahir Siddiqui, M. Ishaque and Asif Tanveer (2014). study of ethnobotany and indigenous use of *calotropis procera* (ait.) in cholistan desert, punjab, Pakistan. *Journal of Agric. Res.,* 52(1): 117-126

Barbosa, N. P. U., almeida-cortez, J. S. and fernandes, G. W. (2007). Uma estranha Na paisagem. *Ciência hoje*, 41:70-72.

Bonjar, Gills and Farrokhi, P. R. (2004). Antibacillus activity of some plants used intraditional medicine of Iran. *Niger Journal. Nat. Prod. Med*. 8: 34-39.

Cunningham, A. B. (2001). Applied ethnobotany: people, wild plant use and conservation. Earth scan, London. p.300.

Ghias, U., Abdur Rauf, Naveed Muhammad, Shabana, Nadia Malik and Mohsina. (2012). Phytochemical and Pharmacological Studies of the Whole Plant of *Calotropis procera Middle-East Journal of Medicinal Plants Research* 1(4): 71-74

Goyal, M. and Mathur, R. (2011). Antimicrobial potential and phytochemical analysis of plant extracts of *Calotropis procera. International Journal of Drug Discovery and Herbal Research,* 1(3):138-143.

Jagan, M., Reddy, P., Ismail, Shareef M., Gopinath, S. M., Dayananda, K. S., Ajay, Mandal and Purushotham, K. M. (2014). Phytochemical Analysis of Some Indigenous Wound Healing Plants *Global Journal of Research on Medicinal Plants & Indigenous Medicine*. 3(3):101– 104

Kabir, H. and N.A. Khan. (2003). Unani medicinal plants Hamdard University Campus, Hamdard Medicus. 1: 34-40.

Kuta, F.A. (2008). Antifungal effects of *C. Procera* stem back on *Epidermophyton flocosum* and *Trichophyton gypseum. African Journal of Biotechnology,* 7(13): 2116-2118.

Noatay, K.L. (2005). *Aak, wild plant that has medicinal value*. The Tribune, Chandigarh, India http//www.tribuneindia.com/2003/2003: 1215/agro.htm.

Okoli, R.I., Agbe, O., Ohaju-Obodo, J.O. and Mensah, J.K. (2007). Medicinal plants used for managing some common ailments among Esan people of Edo State, Nigeria. *Pakistan Journal of Nutrition* 6(5):490-496.

Olasupo, N.A., Grillo, J.A., Obayori, O.S. and Smooth, S.I. (2004). Antibacterial activity of crude extract of *Calotropis procera* against food-spoilage organisms. *Journal of Research and Review in Science* 3:92-96.

Orwa, C., Mutua, A., Kindt, R., Jamnadass, R. and Anthony, S., (2009). Agroforestree Database: a tree reference and selection guide version

4.0. World Agroforestry Centre, Kenya.

Parsons, W. T.; Cuthbertson, E. G., (2001). Noxious weeds of Australia. CSIRO Publishing, pp. 712.

Ramachandran, C., Peter, K. V. and Gopalakrishman, P. K. (1980). Drumstick (*Moringa oleifera*): A multi-purpose Indian vegetable. Economic Botany 34(3):276-283.

Sharma, A. K., Kharib, R. and Kaur, R. (2011). Pharmacognostical aspects of *Calotropisprocera. Int. J. of pharma and biosciences,* 2(3):480-488.

Sofowora, A. (1993). Medicinal Plants and Traditional Medicine in Africa. Spectrum Books Ltd., Ibadan, Nigeria, pp. 191-289

Vishwa, N. Verma. (2014). The chemical study of Calotropis International *Letters of Chemistry, Physics and Astronomy.* 1 (2): 74-90.

W.H.O. (1991). *Guidelines for the assessment of herbal medicines.* Programme on traditional medicine, WHO, Geneva, pp56-91.