

## Ethnobotanical study of wound healing plants in kpando traditional area, ghana.

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### Abstract

An ethnobotanical survey was undertaken in the Kpando Traditional Area of Volta Region in Ghana to identify and record information on medicinal plants used for treating wounds.

Methods: Traditional Medical Practitioners (TMP's) and inhabitants both young and adults were interviewed using semi-structured questionnaires and open-ended conversations. Field trips were made to the sites where TMP's harvest plants.

Results: The survey identified and recorded 27 plants species from 20 families, used for treating wounds in Kpando. The Euphorbiaceae (30.0 %) was the most represented plant family while herbs made up 57.0 % of the total medicinal plants used. Ten plant species namely; *Adiatum veneris capillus* L. (Rutaceae), *Vernonia colorata* (Willd.) Drake (asteraceae/compositae), *Combretum dolichopetalum* Engl. & Diels (Combretaceae), *Coffee arabica* (Rubiaceae), *Milicia excelsia* (Welw.) C. C. Berg. (Moraceae), *Anogeissus leiocarpus* (DC) Guill and Perr. (Combretaceae), *Spondias mombin* L. (Anacardiaceae), *Bridelia ferruginea* Benth. (Euphorbiaceae), *Amaranthus spinosus* Linn. (Amaranthaceae) and *Corchorus olitorius* L. (Tiliaceae) have not previously been documented for the treatment of wound in Ghana.

The leaf was the most commonly used plant part while grinding the fresh part of plant to form poultice was the most common method of traditional drug preparation. Almost all the medicinal plants (95%) are harvested from immediate surroundings. Knowledge of the use of plants as medicines does not only remain with the older generation but extends to the youth who show much interest. Majority still depends on the use of plants for wound healing as the first choice of medication.

Conclusions: Different number of plants species are used for treating wound among the people of Kpando Traditional Area. Several traditional uses of these plants still need to be explored by both *in vitro* and *in vivo* bioassays leading to further investigations for the identification of their chemical compounds of therapeutic value.

**Keywords:** Ethnobotanical survey, Traditional Medical Practitioners, Wounds, Medicinal Plants

### Introduction

Wound occurs as a result of physical injuries that break and expose the skin epidermal and dermal layers, causing damage to the blood vessels and leading eventually to bleeding. Wound healing is a complex sequence of events initiated by the stimulus of injury to tissues. These events involve four main processes: (a) coagulation, (b) inflammation and debridement of wound, (c) epithelia repairs and (d) tissue remodeling and collagen deposition [1, 2].

Any agent that accelerates one or two of the above events is a promoter of wound healing [3]. Several drug classes have been used in the management of wounds. Among these are the antibiotics; Penicillin and streptomycin which have been widely employed in combating post-operative infections in man and animals [4]. Although these chemical substances are effective against wound infections they sometimes exhibit numerous adverse effects. Moreover, many microbes have developed

resistance to these synthetic drugs. It is in this vein that plants that possess wound healing potentials and can either destroy or inhibit the growth of wound infections with lesser adverse effect are being sought for. Medicinal plant extracts, decoctions and concoctions have been in use traditionally to treat various skin lesions (burns and wounds). The significant successes recorded have led to investigation into medicinal plants with a view to confirming these acclaimed properties. Records have it that some of these plants have demonstrated wound healing properties in various animal models [5, 6, 7, 3, 8]. It is also on record that different parts of plants used for wound healing contain some active principles or components that are antimicrobial and nutritive in function [9]. Thus, the importance or the need to search for new anti-wound infectious compounds from plants cannot be underestimated. This study was therefore designed to collate information from an indigenous group of people living in the Kpando Traditional Area in the Volta Region of Ghana about their current traditional uses of plants for the treatment of wounds and to identify the possible phytoconstituents responsible for the wound healing effect as the

first step towards the isolation and synthesis of new anti-infectious compounds.

## Study area

### Ethno pharmacological survey

The study area is Kpando Traditional area within the Kpando district, now Kpando Municipal. Kpando Municipal is located in the Volta Region of Ghana and it is one of the oldest in the country. The district lies within latitudes 6° 20' N and 7° 05' , and Longitude 00° 17' E. It shares boundaries with Biakoye District in the North, Hohoe District to the East, and the newly created North Dayi District in the South. The Volta Lake which stretches over 80km of the coastal line, demarcates the Western boundary.

The district covers a total land area of 820 sq. km representing 45% of the Volta Region with almost 40% of the land being

submerged by the Volta Lake. Kpando, the district capital, is 90 km from Ho, the Regional capital. The location of the district places it at a very strategic position with potential for fast economic development.

Kpando Municipality falls within the tropical zone, and it is generally influenced by the South West monsoons wind from the South Atlantic Ocean and the dry harmattan winds from the Sahara. The Municipal is therefore characterised by two rainy seasons. The major one occurs from mid-April to early July and the minor from September to November.

The vegetation of the Municipal is of Guinea Savannah Woodland, Deciduous and Thick Forest types. It is certain that the Municipal was densely forested in former times. But huge forest areas have been destroyed and converted to other land uses during the past decades. However, the indigenes encountered in this area were mainly farmers.



Figure 1: A map showing the ethnobotanical study area of Kpando Municipality.

## Ethnobotanical survey

Plant collection and identification: A total of 70 questionnaires were administered and interviews were conducted with both old and young local people in ten villages in all the three Traditional divisional zones of Kpando that comprise the study area (Fig. 1). In each village, respondents were randomly selected and interviewed. The interviews were conducted with a fairly open framework that allowed for focused, conversation and two-way communication. Also, some local traditional medical practitioners believed to have the greatest knowledge about the traditional uses of plants in the area were identified and involved in this study. Group interviews as well, were conducted in order to determine group consensus on the plant species used for wound healing. Field interviews involving walking with the local people to the areas where they normally collected their medicinal plants while interviewing them were also adopted. Throughout the interviews, the local names of the plants, the parts used, method of preparation of crude drug from the plants, mode of application were recorded. Only species mentioned by at least two respondents for the treatment of wound across the study area were selected in order to confirm the use of these species. In cases where the plant species were not immediately identifiable with botanical names, they were brought to the herbarium, Department of Environmental Sciences, School of Biological Sciences, University of Cape Coast, where they were identified.

A total of 7 TMP's were interviewed amongst whom one was literate. Their ages range from 34 to 80 years with more of them in the older side of the range. Among them was only one woman.

## Result and Discussion

## Ethnobotanical Survey

The study reveals that different number of plants species are used for treating wound diseases among the people of Kpando Traditional Area. Plant species belonging to 27 species and 20 families were identified as being used by most of the people of this area for wound treatment. Table 1 showed the list of the species identified in the study with their botanical names, local names and parts used. Some of these plants are cultivated by the people themselves while others grow in the wild. The medicinal plants showed family dominance, suggesting that some families are more important source of potential medicinal plant species than others. Of the 20 different families which the people of this area consult for wound healing, the family Euphorbiaceae (30.0 %) contributed most species (six) to the medicinal plant diversity in this study. This was followed by Asteraceae and Combretaceae (10.0 %) each with (two) species while the remaining families Pteridaceae, Amaranthaceae, Asclepiadaceae, Fabaceae, Anacardiaceae, Meliaceae, Rubiaceae, Tiliaceae, Areceae, Boraginaceae, Moraceae, Musaceae, Lamiaceae, Malvaceae, Araceae, Bignoniaceae and Ancathaceae recorded one species each. Ten plant species namely; *Adiatum veneris capillus L.* (Rutaceae), *Vernonia colorata (Willd.) Drake* (asteraceae/compositae), *Combretum dolichopetalum Engl. & Diels* (Combretaceae), *Coffea arabica* (Rubiaceae), *Milicia excelsia (Welw.) C. C. Berg.* (Moraceae), *Anogeissus leiocarpus* (DC) Guill and Perr. (Combretaceae), *Spondias mombin L.* (Anacardiaceae), *Bridelia ferruginea Benth.* (Euphorbiaceae), *Amaranthus spinosus* Linn. (Amaranthaceae) and *Corchorus olitorius L.* (Tiliaceae) have not previously been documented for the treatment of wound in Ghana.

**Table 1: Identity of Wound healing plants collected from the study area.**

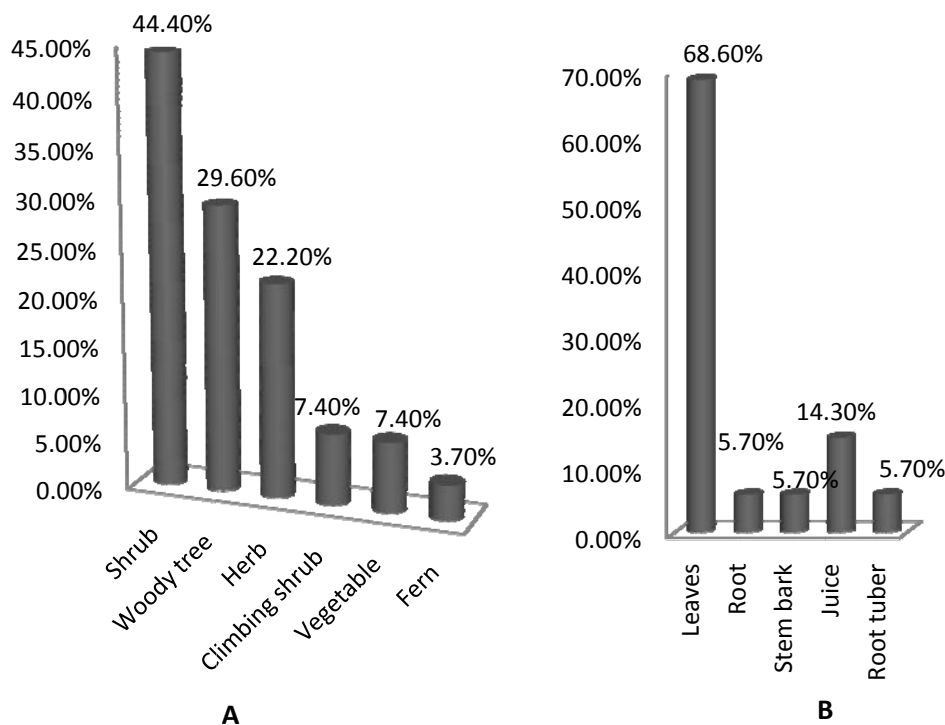
Plant	Growth form	Family	Local name	Part used
<i>Adiatum-capillus veneris L.</i>	fern	Pteridaceae	litsagbadze	leaves
<i>Amaranthus spinosus (L)</i>	Shrub	Amaranthaceae	Matonui	Root
<i>Anogeissus leiocarpus (DC) Guill &amp; Perr</i>	Woody tree	combretaceae	hehe	leaves
<i>Azadiracta indica A. Juss</i>	Woody tree	Meliaceae	Liliti tovi	leaves
<i>Bridelia ferrugenia Benth</i>	A small tree/Shrub	Euphorbiaceae	huhoe	Bark/leaves
<i>Calotropis procera (Aiton) Dryand</i>	Herb/shrub	Asclepiadaceae	wangatsi	Leaves
<i>Chromolaena odorata (L)</i>	Herb	Asteraceae	Acheamong	leaves
<i>Coffea arabica</i>	shrub	Rubiaceae	coffee	leaves
<i>Colocasia esculenta L.</i>	Vegetable	Araceae	Mankani	Tuber/juice
<i>Combretum dolichopetalum Engl. &amp; Diels</i>	Climbing shrub	combretaceae	ahe	leaves
<i>Corchorus olitorius L.</i>	vegetable	Tiliaceae	Ademe/singli	leaves
<i>Crescentia cujete L.</i>	Tree	Bignoniaceae	Goti	leaves
<i>Elaies guineensis Jacq.</i>	Tree	Areceae/Palmaceae	De	Fronds/leaves
<i>Heliotropium indicum Linn.</i>	Shrub/Herb	Boraginaceae	Zeto	leaves
<i>Jatropha curcas L.</i>	Small tree/shrub	Euphorbiaceae	Kportikporti	Leaves/root/juice
<i>Justicia flava (Forssk.) Vahl</i>	Straggling/erect herb	Acanthaceae	Eli	Leaves

**Table 1: Identity of Wound healing plants collected from the study area (Continued).**

Plant	Growth form	Family name	Local name	Part used
<i>Mallotus oppositifolius</i> Geiseler Mull. Arg.	Shrub	Euphorbiaceae	Nyeti	Leaves
<i>Manihot esculanta</i> Crantz	Shrub	Euphorbiaceae	Agbeli	Leaves/tuber
<i>Milicia excelsia</i> (Welw.) C.C. Berg	Woody tree	Moraceae	odum	Stem bark/leaves/juice
<i>Mucuna sloanei</i> Fawc. & Rendle	Climbing shrub	Fabeceae	Akploloe	juice/leaves
<i>Musa paradisiacal</i> L.	herb	Musaceae	Abladzo	juice
<i>Ocimum gratissimum</i> L.	shrub	Lamiceae	dzeveti	leaves
<i>Phyllanthus fraternus</i> G.L. Webster	herb	Euphorbiaceae/Phyllanthaceae	Kpavideme	leaves
<i>Securinegea virosa</i> Roxb. ex wild. Baill	Shrub	Euphorbiaceae/Phyllanthaceae	Hlese	Leaves
<i>Sida acuta</i> Burm. F.	Shrub	malvaceae	Shosho	leaves
<i>Spondia monbim</i> L.	Woody tree	Anacardiaceae	Akuko	leaves
<i>Vernonia colorata</i> (Willd.) Drake	Shrub	asteraceae/compositae	Pepedi/gbodukui	Leaves

This study has revealed that traditional medicinal practices have a wide acceptability among the Kpando people probably because they believe in its effectiveness and also due to the lack of access to modern health care delivery system (only one hospital and a clinic all situated at the district capital). It was interesting and revealing to have listened to educated people in the area who prefer using the plants as their first choice of medication to treat wounds. Also the unavailability and the financial constraints by

many to purchase orthodox drugs may also have contributed largely to preference of traditional medicine over the orthodox drugs. Almost all the medicinal plants (95%) are harvested from immediate surroundings. Knowledge of the use of plants as medicines does not only remain with the older generation but extends to the youth who show much interest. Majority still depends on the use of plants for wound healing as the first choice of medication.



**Figure 2: The percentage occurrence of (A) growth forms and (B) part of plant species identified in the study.**

The study revealed diversity in plant parts used for the treatment of wounds. Figure 2 shows the percentage growth forms (A) and percentage plant parts of species identified in the study. The plant species parts that are used range from leaves, roots, stem bark, juice to tubers only, or a combination of two or more in a species or with those of other species as shown in Table 1. However, the leaf was the most commonly used plant part (68.6 %). This is consistent with other studies [10] where leaves were the most commonly harvested parts of medicinal plants used to prepare herbal medicine. Shrubs (44.4 %) and trees (29.6 %) were the most predominant growth forms harvested for wound healing while grinding the plant part to form poultice was the commonest mode of traditional drug preparation. Some preparations included the use of more than one species or required additional ingredients. For example, *Mallotus oppositifolius* (Geiseler) Mull. Arg. is mixed with *Crescentia cujete* L. and grind together before applied to wound (Table 2). For fresh cuts and small wounds, *Chromolaena odorata*

*L.*, *Manihot esculenta* Crantz, *Musa paradisiacal* L. and *Ocimum gratissimum* L. are used for fast arresting of blood oozing and healing of wounds. This may only indicate that these plants contain therapeutic compounds such as vitamins c and some amino acids which are responsible for the fast healing of wounds.

Species identified in this survey were noted for their folk medicinal values. The knowledge of these medicinal values constitutes parts of the people's culture that is passed from one generation to another. Previous studies and the current phytochemical screening conducted on some of the plants revealed that these species were essentially rich in alkaloids, flavonoids, tannins, steroids (Table 3). These phytoconstituents are generally noted for their immense contributions to antioxidant activities and therapeutic effects of medicinal plants. It is therefore not surprising to have noticed that scientific reports on majority of the wound healing plants indicated antioxidant activity.

**Table 2: List of plants with their mechanism of actions and mode of preparation and administration**

Plant Name	Voucher No.	Mechanism of action	Mode of administration
<i>Adiatum veneris-capillus</i> L.	UCC/H/	Causes healing	Grind and add to wound
<i>Amaranthus spinosus</i> L.	UCC/H/5165	Causes healing	Grind and add to wound
<i>Anogeissus leiocarpus</i> (DC) Guill & Perr	UCC/H/267	Causes healing	Grind or squeeze tender fresh leaves and apply to wound or boil leaf/bark and dip affected part in it
<i>Azadirachta indica</i> A. Juss	-----	Prevent tetanus and causes healing	Grind and add to wound
<i>Bridelia Ferruginia</i> Benth	UCC/H/3284	Causes healing	Bark grind and add to wound or boil leaf and dip site in it
<i>Calotropis procera</i> (Aiton) Dryand	UCC/H/3053	Causes healing	Grind and add to wound
<i>Chromolaena odorata</i> L.	UCC/H/3277	Causes healing/arrest bleeding	Grind or squeeze juice and add to wound
<i>Coffea arabica</i>	-----	Causes healing	Grind with salt and tie to wound
<i>Colocasia esculenta</i> L.	-----	Arrest bleeding	Add juice to wound
<i>Combretum dolichopetalum</i> Engl. & Diels	UCC/H/308	Causes healing	Grind with coffee leaves and add to affected part
<i>Corchorus olitorius</i> L.	UCC/H 306	Causes healing	Grind and add to wound
<i>Crescentia cujete</i> L	UCC/H/4353	Causes healing	Grind and add to wound
<i>Elaeis gueneensis</i> Jacq.	UCC/H/4617	Arrest bleeding	Grind and add to wound
<i>Heliotropium indicum</i> L.	UCC/H/4873	Cleans surface of wound , closes up wound	Expose leaf to fire and cover the surface of wound/leaf expose to fire, squeeze out juice into wound
<i>Jatropha curcas</i> L.	-----	Arrest bleeding and prevent tetanus	Leaf grind with sugar sugar and apply to wound
<i>Justicia flava</i> (Forssk.) Vahl	UCC/H/5155	Healing of wound	Burn together with white beans, groundnut, cocoyam and apply to sore



Table 2: List of plants with their mechanism of actions and mode of preparation and administration (Continued).

Plant Name	Voucher No.	Mechanism of action	Mode of administration
<i>Mallotus oppositifolius</i> <i>Geiseler</i> Mull. Arg	UCC/H/389	Healing of wound	Leaf grind with onion and apply to wound
<i>Manihot esculenta</i> Crantz	UCC/H/4606	Arrest bleeding	Tuber/leaf grind and add to wound
<i>Milicia excelsia</i> (Welw.) C.C. Berg	-----	Healing of wound	Juice added to cotton and apply to wound
<i>Mucuna sloanei</i> Fawc. & <i>Rendle</i>	UCC/H/932	Arrest bleeding	Juice drop into wound
<i>Musa paradisiacal</i> L.	-----	Arrest bleeding	Juice apply to fresh wound
<i>Ocimum gratissimum</i> L.	-----	Arrest bleeding, causes healing	Fresh leaves grind or squeeze into fresh wound
<i>Phyllanthus fraternus</i> G.L. Webster	-----	Heals wound, boils and stomach pains	Grind and add to wound
<i>Securinegea virosa</i> (Roxb. Ex Wild.) Baill.	UCC/H/424	Causes healing	Grind and add to wound
<i>Sida acuta</i> Burm. f	UCC/H/2383	Arrest bleeding	Leaves grind with leaves of <i>Combretum dolichopetalum</i> and add to wound
<i>Spondias monbim</i> L.	-----	Healing wound	Boils leaves and dip affected part in it/ grind and add to wound
<i>Vernonia colorata</i> (Willd.) Drake	UCC/H/1216	Healing wound/ arresting bleeding	Grind leaves with that of Cassava and tie to wound

Table 3: Phytoconstituents and medicinal values of some of the plants

Plant Name	Medicinal value reported	Phytoconstituents identified/isolated	Reference
<i>Adiatum veneris-capillus</i> L.	Antibacterial, Antifungal, wound healing	sugars, flavonoids, triterpenoids, steroids, Alkaloids, Tannins, Terpenoids, Saponins	[11, 12, 13]
<i>Anogeissus leiocarpus</i> (DC) Guill & Perr	Wound healing, Antibacterial, Antioxidant	Tannins, Flavonoids, Alkaloid, steroids, Anthraquinone glycosides, Saponins	[14, 15]
<i>Azadirachta indica</i> A. Juss	Antioxidant	hydrocarbons, phenolic compounds, terpenoids, alkaloids, glycosides	[16, 17]
<i>Bridelia Ferruginia</i> Benth	Antidiabetic	Tannins, Saponins, terpenoids, Flavonoids, steroids, alkaloids, anthraquinones	[18]
<i>Combretum dolichopetalum</i> Engl. & Diels	Anti-ulcer activity	Alkaloids, flavonoids, tannins	[19]
<i>Corchorus olitorius</i> L.	Antioxidant, Antibacterial, wound healing	Tannins, Flavonoids, glycosides, Saponins	[20, 21]
<i>Crescentia cujete</i> Linn	Antioxidant	steroids, flavonoids, tannins, glycosides, and terpenoids.	[22]
<i>Elaeis gueneensis</i> Jacq.	Wound healing, Antibacterial	Tannins, alkaloids, steroids, saponins, terpenoids, flavonoids	[23]
<i>Heliotropium indicum</i> Linn	Antimicrobial	Alkaloids, saponins, Tannins, glycosides and flavonoids	[24]
<i>Justicia flava</i> (Forssk.) Vahl	Wound healing, Antimicrobial activity	Tannins, alkaloids, flavonoids, glycosides	[25]
<i>Mallotus oppositifolius</i> Geiseler Mull. Arg	Antioxidant, Antimicrobial, Anti-inflammatory	Anthocyanins, flavonoids, tannins, alkaloids saponins, glycosides, steroids	[26, 27, 28]
<i>Milicia excelsia</i> (Welw.) C.C. Berg	Antibacterial, wound healing	Tannins, alkaloids, flavonoids, saponins, glycosides and arthaquinones	[29]

Table 3: Phytoconstituents and medicinal values of some of the plants (Continued).

Plant Name	Medicinal value reported	Phytoconstituents identified/isolated	Reference
<i>Musa paradisiacal L.</i>	Wound healing, Antioxidant	Tannins, saponins, reducing and non reducing sugars, sterols and triterpenes	[30]
<i>Ocimum gratissimum L.</i>	Antioxidant, antimicrobial	Alkaloids, tannins, saponins steroids, terpenoids, phlobatannins, Anthraquinones, flavonoids and cardiac glycosides	[31]
<i>Phyllanthus fraternus G.L. Webster</i>	Antifungal	lignans, flavonoids, hydrolysable tannins (ellagitannins), polyphenols, triterpenes, sterols and alkaloids	[32, 33]
<i>Spondias monbim L.</i>	Antioxidant,	alkaloids, flavonoids, tannins, saponins, sterols, quinines, phenolic compounds	[34, 35]

Various ethnobotanical surveys have been conducted to identify plants used in folkloric medicine to treat wounds. There are species which are cited in this study. Out of the 27 identified plants, *Securinega virosa* (Roxb. Ex Wild.) Baill. [36], *Musa paradisiacal L.* [37, 38]; *Justicia flava* (Forssk.) Vahl [25, 38], *Elaeis guineensis* Jacq., *Sida acuta* Burm.f., *Manihot esculanta* Crantz, *Ocimum gratissimum L.*, *Jathropa curcas L.*, *Colocasia esculanta L.*, *Chromolaena odorata (L.)*, [38], *Mallotus oppositifolius* Geiseler Mull.Arg. [27] have previously been mentioned or investigated for wound healing properties in Ghana. Various other plants

traditionally used in wound healing have also been identified by other researchers from other geographical locations in Ghana. Examples are *Commelina diffusa* Burm. f., *Spathodea campanulata* P. Beauv.[38, 39], *Clerodendro splendens*, G. Don [40], *Secamone afzelii* (Schult.) K. Schum. [39]. These plants specie did not surface in this study. One can therefore suggest that geographical factors such as vegetation type and climatic conditions may have direct influence on the type of folkloric medicinal plants used by indigenes.

Table 4: Relative occurrence of the plants species for wound healing in the study area.

<b>Common</b>	<i>Heliotropium indicum L., Musa paradisiacal L., Occimum gratissimum L., Jathropa curcas L., Combretum dolichopetalum Engl. &amp; Diels, Chromolaena odorata L., Anogeissus leiocarpus (DC) Guill &amp; Perr</i>
<b>Frequent</b>	<i>Amaranthus spinosus L., Phyllanthus fraternus G.L. Webster, Sida acuta Burm. f., Vernonia colorata (Willd.) Drake, Adiantum capillus-veneris L., Manihot esculenta Crantz, Crescentia cujete L., Bridelia ferruginia Benth.</i>
<b>Occasional</b>	<i>Azadirachta indica A. Juss, Elaies gueneensis Jacq., Securinegea virosa (Roxb. Ex Wild.) Baill., Coffee Arabica, Mallotus oppositifolius Geiseler Mull. Arg., Milicia excels (Wele.) C.C. Berg, Colocasia esculenta L., Calotropis procera (Aiton) Dryand, Mucuna sloanei Fawc. &amp; Rendle, Justicia flava (Forssk.) Vahl, Spondias monbim L., Corchorus olitorius L.</i>

In the survey, *Heliotropium indicum L.*, *Musa paradisiacal L.*, *Occimum gratissima L.*, *Jathropa curcas L.*, *Combretum dolichopetalum Engl. & Diels*, *Chromolaena odorata L.*, *Anogeissus leiocarpus (DC) Guill & Perr* showed the highest incidence of encounter (Table 4). It is assumed that many of the indigenes from the study area prefer to use the above mentioned plant species for wound healing relatively more often than the others. Thus, based on the result of the survey, these plants could be considered promising for further scientific studies.

## Conclusion

The ethnopharmacological survey shows that a large number of medicinal plants are used in Kpando Traditional area of Volta region in Ghana for treating wounds. The knowledge of the use of

plants to treat diseases has been with the people for generations but has not been recorded. The survey also showed the wound healing potential of some plants based on traditional knowledge in the Kpando Traditional area of Volta region hitherto not documented in Ghana. The results of the literature research showed that the antimicrobial activity and antioxidant activity of majority of these plants have largely been investigated and can explain parts of the traditional uses of these plants. However, several traditional uses of these plants still need to be explored by both *in vitro* and *in vivo* bioassays leading to further investigations for identification of other chemical compounds of therapeutic value.

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