Available online at http://www.ifgdg.org

Int. J. Biol. Chem. Sci. 10(5): 2123-2137, October 2016

ISSN 1997-342X (Online), ISSN 1991-8631 (Print)

International Journal of Biological and Chemical Sciences

Original Paper http://ajol.info/index.php/ijbcs http://indexmedicus.afro.who.int

Ethnobotanical study of Senegal custard apple (*Annona senegalensis* Pers.) in Dassa-Zoumétownship, Republic of Benin

Jacques Boco ADJAKPA[1*], Léonard Essehou AHOTON[2], Frida Kobayé OBOSSOU[1] and Clotilde OGOUGBÉ[1]

[1]*Ecole Polytechnique d'Abomey-Calavi, Université d'Abomey-Calavi, Benin.*
[2]*Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, Benin.*
[*]*Corresponding author; E-mail: adjakpaj@yahoo.fr, Tel: (+229) 95151464 / 97635189*

ABSTRACT

Medicinal plants play an important role in the well-being of population in tropical countries. The objective of the study was to investigate the ethno botanical uses of custard apple (*Annona senegalensis*) in Benin. A survey carried out in Dassa-Zoumé township showed that population uses *Annona senegalenis* to treat many diseases including injury, wound, sting of bee or wasp, snake bite, sting of scorpion, malaria etc. Various organs of the plant (leaves, stems, roots, flowers and fruits) were involved in the preparation of many medical recipes. These recipes require different formulations (decoction, infusion, grinding, calcination, chewing, toothpick and trituration). A total of 65 uses of *A. senegalensis* were recorded in the township. Bathing of body, drinking, dressing in hot water, local application, scarification, instillation, washing of mouth were various modes of administering the medicines. Given the numerous therapeutic and nutritional values of this plant, it is important that the scientific world gives more attention to this shrub by domesticating it and characterizing the active principles present in various organs of this plant.

Keywords: Benin, medicinal plant, traditional uses, diseases, treatment

INTRODUCTION

In developing countries especially in Africa, predominantly rural populations face to a lack of coverage in health needs and the unavailability of essential drugs often at high cost (Aba Toumnou et al., 2012). Interestingly, several plant species have been inventoried and described both in West Africa and Central Africa. In the whole world, 80% of the population and 90% in the developing world used medicinal plants for primary health care (Jiofack et al., 2010). Plants are used not only as foods (Codjia and Assogbadjo, 2003; Diarra et al., 2016) but many are known for their therapeutic virtues (Agbankpé et al., 2016). Medicinal plants

DOI: http://dx.doi.org/10.4314/ijbcs.v10i5.15

have been harvested from the wild since ancient times (Dhillion and Ampornpan, 2000) and it is still used despite the widespread of modern medicine. It remains the first recourse for most African populations because of the inaccessibility of conventional drugs (Fatoumata, 2005). There are also diseases that modern medicine cannot cure but are traditionally treated by plants (Koni and Bostoen, 2008). Therefore, herbal medicine has become useful and an inescapable science. In Benin, many works reported the use of plants in health care. Adomou et al. (2012) investigated that a total of 205 plant species grouped in 181 genera and 74 families were used in the formulation of 41 recipes for the treatments of 37 diseases and symptoms. Some recent scientific results focused on Loranthaceae species, parasite plants of *Cola nitida* used in the treatments of sterility, miscarriages and menstrual troubles (Ahamide et al., 2015). A review on the uses of *Tridax procumbens* shows that the plant plays key roles in animal breeding as well as in herbal medicine (Ahossi et al., 2014). The use of some plants can result in complete healing of diseases showing their effectiveness. The scientific valorization of herbal medicine should lead in particular to the formulation of drugs with well-defined posology and doses. It is of importance to document these medicinal plants through ethnobotanical surveys (Betti, 2004). This allowed to know plants used in traditional medicine. Excessive use of certain medicinal plants causes their disappearance. To better conserve and manage these medicinal plants, scientific studies must be conducted to know them better. Therefore, the objective of the present study was to investigate the therapeutic uses of custard apple (*Annona senegalensis*) in Benin.

MATERIALS AND METHODS

Study area

The Township of Dassa-Zoumé (is between latitude 07° 29'and 07° 56' north and longitude 01° 58' and 02° 29' east) is one of six townships of Department of Collines with an area of 1711 km^2 (Figure 1) and represents 1.52% of the total area of the national territory (INSAE, 2002). It is bordered in the north by Glazoué township, in the south by Zagnanado and Djidja townships, in the east by Savè and Kétou townships, in the west by Savalou township. Dassa-Zoumé township is subdivided into ten (10) Districts namely: Dassa I, Dassa II, Akoffodjoulé, Gbaffo, Kèrè, Kpingni, Lèma, Paouignan, Soclogbo, and Tré (INSAE, 2002).

Plant material

The material used in this study was Senegal custard apple (*A. senegalensis)*.

Methods

Selection of villages

Fifteen localities were selected according to the following criteria (Table 1): abundance of *A. senegalensis*, villages known for their attachment to tradition and which were determined by an exploratory survey.

Survey in the villages

The survey was conducted based on the questionnaire administered to individual members of the sample. The data collected were the diseases for which the plant was used, the various organs sampled, the preparation methods of medicinal recipes, and the origin of the knowledge kept by individual on the plant. Based on the size of the population of each village, a percentage of 15% was sampled. Respondents were generally composed of elders, heads of village, hunters, healers and others.

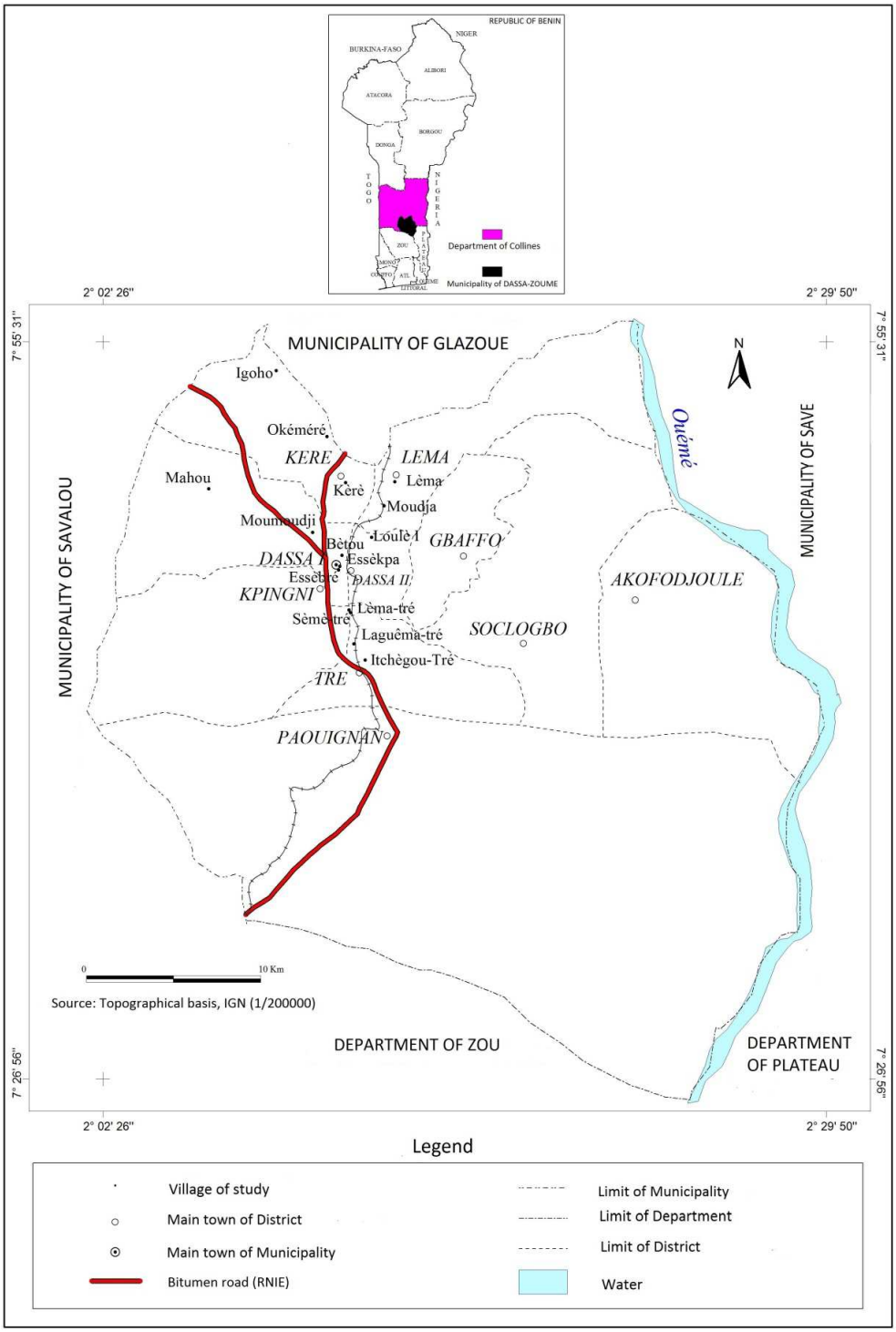

Figure 1: Location of villages surveyed in Dassa-Zoumé township.

Table 1: Distribution of the number of respondents per village.

Districts	Villages	Number of households	number of respondents
Dassa-Zoumé I	Essèbrè	203	31
	Essèkpa	369	55
Dassa-Zoumé II	Mahou	163	24
	Loulè 1	133	20
	Moumoudji	194	29
	Moudja	68	10
	Bètou	210	32
Lèma	Lèma	147	22
Tré	Sèmè-tré	49	7
	Itchêgou-tré	114	17
	Laguêman-tré	172	26
	Lèma-tré	174	26
Kèrè	Kèrè	360	54
	Okéméré	259	39
	Igoho	213	32
Total	**15 villages**	**2828**	**424**

Source: INSAE (2002)

Data processing

The processing of data collected during the survey was manual. These data were codified and entered and processed through the Excel software, from which the analysis tables, frequencies and graphs were made.

RESULTS

Socio-economic characteristics of the respondents

Table 2 showed the socio-economical profile of the respondents. From this table, it came out that most of the respondents were men. Generally, the respondents were elderly persons and their age group varied from 20 to more than 70 years. Informants were predominantly from idaatcha ethnic group. A large proportion (>77%) of the respondents were farmers. Merchants, healers and employees were also relatively represented in the surveyed sample.

Uses of *A. senegalensis*

Fruits were the most consumed by people with a percentage of 95.69% followed by leaves (4.07%) and seeds (0.24%).

The Table 3 showed the therapeutic uses of the species. *A. senegalensis* organs were mostly used in the treatments of injury (15.18%), of wound (12.53%), of sting of bee

or wasp (11.57%), of snake bite (10.96%), of sting of scorpion (7.95%), of malaria (6.27%), of dizziness (4.34%), of swelling (3.98%), of dermatosis (2.41%) (Figure2). The leaves (36.02%), the bark of roots (32.17%), roots (17.37%) and bark (11.93%) were the most used parts of the plant (Figure 3). The high proportion of the use of bark of root and roots is a significant threat for the conservation of the species. The most common methods of formulation were pounding (40.81%), trituration (31.08%), decoction (18.07%), chewing (6.05%), infusion (3.32%), burning (2.61%) and toothpicks (1.07%) (Figure 4).Treatment regimens generally included drinking (28.82%), local application (23.76%), scarification (20.88%), bathing (16%), dressing with hot water (1.06%), instillation (0.24%) and mouthwash (0.24%) (Figure 5).

Table 2 : Socio-economic profile of the respondents.

Variables	Count	Proportion (%)
Gender		
Male	249	62.25
Female	151	37.75
Age		
20-50 years	234	58.5
51-70 years	106	26.5
> 70 years	60	15
Sociocultural groups		
Idaatcha	389	97.25
Peulh	4	1
Mahi	1	0.25
Others	6	1.5
Occupations		
Farmers	308	77
Merchants	23	5.75
Healers	19	4.75
Employees	9	2.25
Others	41	10.25

Table 3: *A. senegalensis* medicinal recipes.

Various uses	Citation frequency	Organs used	Formulations	Methods of administration	Dosage
1. Sting of bee or wasp	96	Leaves, bark of stem, roots	Triturate young leaves and rub against the part	Dermal	At most 3 times
2. Sting of scorpion	66	Leaves, bark of stem, roots	Chewing the root of the plant and swallow saliva or used the ground bark of the root for scarification	Oral or dermal	At least 3 times once
3. Injury	126	Leaves, bark of stem and roots	Squeeze the juice of ground root bark in the wound then do the dressing.	dermal	Once a day for 3 days
4. Wound	104	Leaves, flowers, bark of stem, bark of roots	Dress the wound with leave decoction then squeeze the juice of ground bark of root in the wound and then do the dressing	dermal (apply directly into the wound)	2 times a day, morning and evening
5. Incurable wound	8	Leaves, bark of stem	Dress the wound with leave decoction then squeeze the juice of ground bark of root in the wound and then do the dressing.	dermal (apply directly into the wound)	2 times a day, morning and evening
6. Serpent bite	91	Leaves, bark of stem and roots	Powder from dry roots is used for scarification and also used in porridge.	Dermal or oral	3 times per day for the porridge
7.Non rabid dog bite	4	Bark of stem, roots	Grind the root of Senegal custard apple and root of cola tree mix with black soap and then apply to the part.	dermal	once
8. Fever	4	Leaves, bark of stem, roots	The decoction of leaves is used as drink and for bathing.	Oral or dermal	3 times per day for a week
9. Malaria	52	Leaves, roots	Drink the filtrate from the mixture of triturated young leaves and lemon juice.	Oral	2 times per day
10. Stomachache	9	Leaves, bark of stem, roots	Infusion of root in the local drink called “sodabi” and drink	Oral	3 times per day

			out of a big glass.		
11. Headache	8	Leaves, fruits, bark of stem, roots	Infusions of ground stem bark in water for bathing the head.	Dermal	At will
12. Migraine	2	Leaves	Bathing the head with triturated young leaves in water and black soap.	Dermal	At will
13. Eye ache	3	Leaves	Triturate the leaves and instill some drops of the extract on the eye.	Dermal (apply directly into the eyes)	2 times per day for 3 days
14. Conjunctivitis	2	Leaves	Triturate the leaves and instill some drops of the extract on the eye.	Dermal (apply directly into the eyes)	2 times per day until healing
14. Swelling	33	Leaves, bark of stem, roots, bark of roots	Grind the root and apply it to the part	Dermal	Once a day for 3 days
15. Allergic reaction	2	Leaves	Triturate the leaves and apply locally it on the part.	Dermal	3 times per day for 3 days
16. Good health	7	Fruit, bark of stem, roots	Infusion of leaves and roots, bath with it using preferably black soap.	Dermal	For 3 days
17. Whitlow	4	Leaves, roots	Plunge fingers in the decoction of leaves and roots.	Dermal	3 times per day until healing
18.Rounded fontanel	1	Leaves	Decoction of *A. senegalensis* leaves, shea leaves and roots, to be drinking and bathing with.	Oral and dermal	2 times per day until healing
19. Alcoholism	3	Roots	Chewing the root and swallow saliva.	Oral	Once per day
20. Kidney sickness	2	Bark of stem, leaves	Triturate young leaves then add lemon juice to the filtrate, to be drinking.	dermal	Once per day
21. Hernia	1	Bark	Decoction of stem barks and adds seven ground Guinea pepper seeds, drink out of a big glass.	Oral	2 times a day. It is advisable to eat beforehand
22. Dysentery	9	Leaves,bark of stem, roots	Triturate young leaves in water and then drink it.	Oral	2 times a day.

23. Diarrhoea	2	Leaves	Triturate young leaves in water and then drink it	Oral	2 times a day
24. Dizziness	36	Leaves	Triturate young leaves for drinking and for washing the head.	Oral and dermal	3 times per day
25.Sexual weakness	6	Leaves	Triturate young leaves in water and then drink it with beer glass.	Oral	Once a day and every morning
26.Sexual impotence	3	Leaves, roots	Grind dry root with unripe banana and sugar, put the powder in the porridge.	Oral	2 times a day until healing
27. Female sterility	6	Leaves, stem, roots	Drink the porridge mixed with the powder of burnt leaves.	Oral	2 times per day for a week
28. Dermatitis	20	Leaves, fruits, bark of stem, roots	Have a bath of infusion of stem bark in water.	Dermal	2 times a day
29. Mycosis	8	Leaves, fruits, bark of stem, roots	Bath with triturated leaves in water.	Dermal	3 times per day for at least 2 days
30. Haemorrhoid	4	Leaves and roots	Decoction of roots to be used as a wash in toilet.	Dermal	3 times a day until healing
31. Ache	2	Leaves, bark of stem	Triturate and spread the leaves on a loincloth then sleep on it in the night.	Dermal	once a day until healing
32. Knee ache	2	Roots, bark of root	Use of powder of dry root by scarification.	Dermal	once
33.Parasitic infection	1	Leaves	Chew young leaves, then swallow the juice	Oral	3 times a day for 3 days
34. Measles	2	Leaves	Triturate *A. senegalensis* leaves and pigeon pea (*Cajanu cajan*), use the solution to bathe, apply some drops of the extract on the eye.	Dermal	2 times per day until healing
35. Chickenpox	2	Leaves	Decoction of leaves of *A. senegalensis*, bambo, citonnella, then bath with.	Dermal and oral	2 times per day until the healing
36. Cough	3	Leaves, roots	Decoction of root and add potash to the solution then	Oral	2 times per day for maximum a week

			drink.		
37. Lumbago	1	Bark of stem	Carry the fibers of stem bark on the hip.	Dermal	until the healing
38. High blood pressure	1	Bark of stem	Put powder of burnt dry leaves of *A. senegalensis* and *Moringa. Oleifera* in porridge and then drink	Oral	Once a day
39. Mumps	2	Bark	Use the mixture of filtrate of infusion of stem bark and triturated leaves and then wash the head with	Dermal	Once a day
40. Epilepsy	1	Root	Add seven grounds Guinea pepper to the filtrate of root decoction, drink out of a big glass.	Oral	2 times a day for 3 weeks
41. Ulcer	8	Leaves, fruits, bark of stem, roots	Drink out of a big glass of filtrate of triturated fruit.	Oral	Once a week for 3 weeks
42. Insufficiency of sperm	1	Leaves	Triturate young leaves in water and add lemon juice and then drink.	Oral	Once a day until healing
43. Sickly	1	Leaves	Decoction of leaves and root, to be drinking and bathing.	Oral	3 times a day until healing
44. Anemia	1	Roots	Decoction of root, and drink.	Oral	3 times a day until healing
45. Sleep disorder	2	Roots	Spread leaves under the mat of the sick.	Dermal	Once a day until healing
46.Dirty menstruation	2	Bark, roots	Decoction of root, drink out of a big glass.	Oral	Twice a day
47. Burn	2	Leaves, roots	Use the juice of ground root bark on the wound.	Dermal	Twice a day
48. Rejection of sperm	1	Leaves	Drink the porridge with a mixture of dried leaves	Oral	3 times a day for a week
49. Skin Outbreak	1	Leaves	Bath with the solution of triturated leaves.	Dermal	3 times a day for at least 2 days
50. Rheumatism	2	Leaves, roots	Decoction of root, drink out of a	Oral	Twice a day

			big glass.		
51. Icterus	4	Leaves, roots	Decoction of root, drink out of a big glass and have a bath with it.	Oral and dermal	Twice a day
52. Oligospermia	10	Leaves, roots	Drink young leaves triturated	Oral	once a day for a week
53. Abscess	2	Leaves, roots	Triturate young leaves with potash and put it on the part.	dermal	Twice a day until healing
54. Toothache	2	Stem, stem of bark	Use root as vegetal brush.	Oral	Once a day
55. Tooth decay	8	Leaves, stem, bark of stem, bark of roots	Have a wash of mouth with young leaves triturated in water.	Oral	At will
56. Loss of appetite	1	Leaves	Drink decoction of leaves	Oral	Twice a day for 3 days
57. Eat sand (adult)	2	Roots	Drink decoction of root.	Oral	Twice a day until healing
58. Difficult delivery	1	Bark of root	Ground root bark of Senegal custard apple and root of pawpaw tree then add salt and palm oil, and afterwards eat it.	Oral	During the delivery
59. Heart palpitation	2	Fruits, seeds	Mix powder of burnt unripe fruits of custard apple with ginger, and then drink it.	Oral	Twice a day
60.Distended stomach	1	Leaves	Root infusion in hot wine of palm oil, to be drinking with a tablespoon.	Oral	3 times per day
61. Vomiting	1	Roots	Decoction of *Combretum lamprocarpum* stem bark and *A. senegalensis* root, then drink it.	Oral	3 times a day
62. Poisoning	1	Fruits	Triturate the fruit in water and drink it.	Oral	3 times a day
63. Washing of eyes suffering from serpent spit	**5**	Leaves, roots	Triturate leaves and make ocular installation with the extract.	Dermal (apply directly into the eyes)	Twice a day until healing
64. Arthritis	1	Leaves, bark of stem, roots	Have a bath with decoction of stem bark.	Dermal	Twice per day for 4 days
65.Uterine Haemorrhage	7	Bark of stem, roots	Grind stem bark and add water and afterwards drink the filtrate.	Oral	Once a day until healing

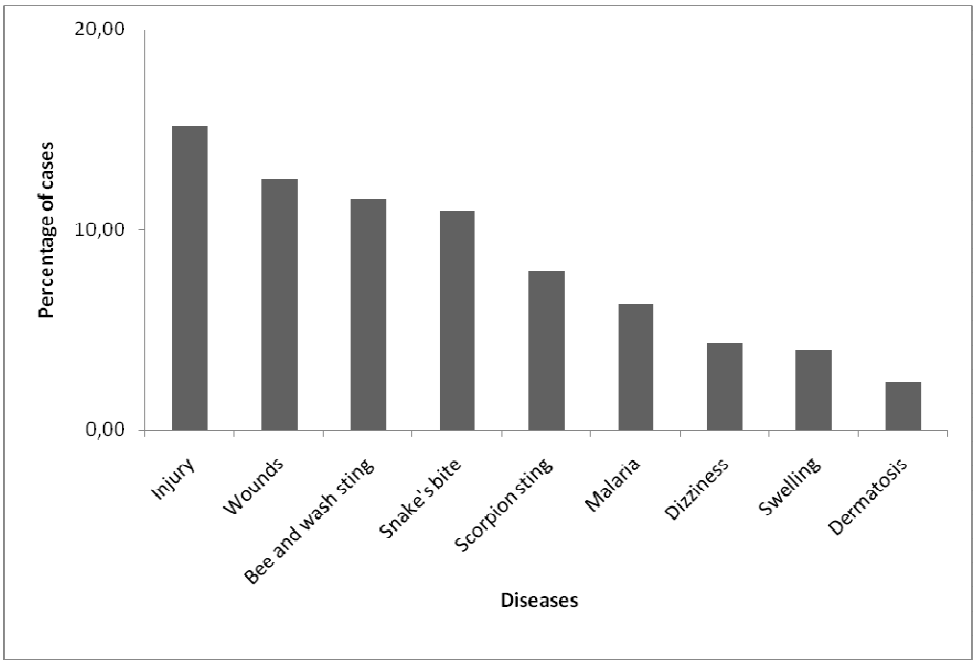

Figure 2: Diseases frequently cited by respondents.

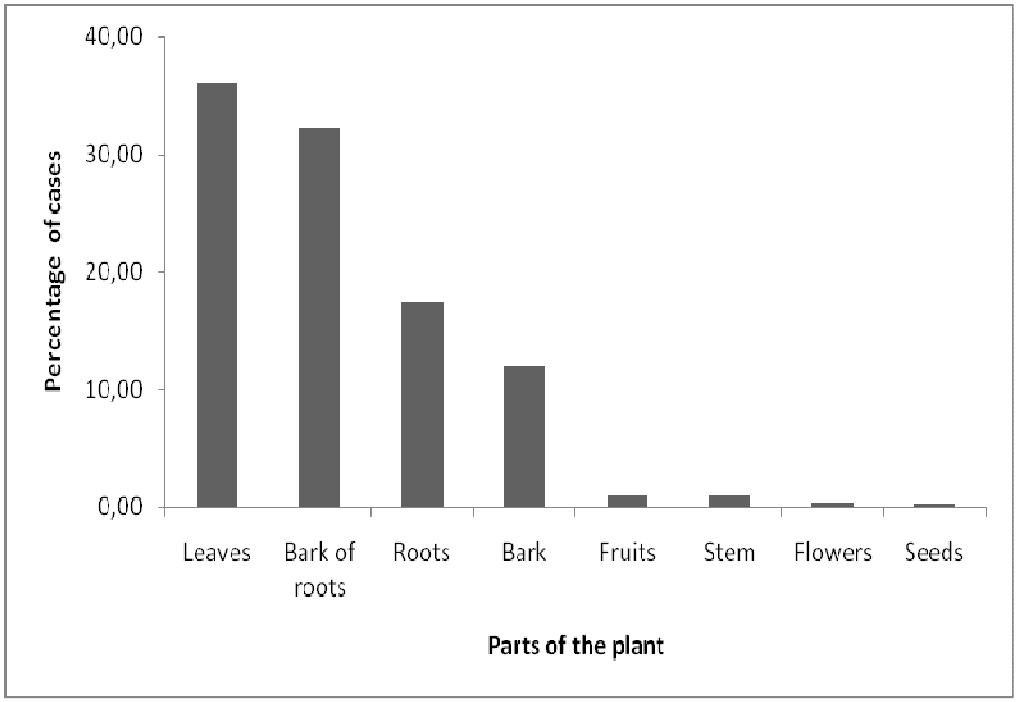

Figure 3 : Parts of *A. senegalenis* used for therapeutic treatments.

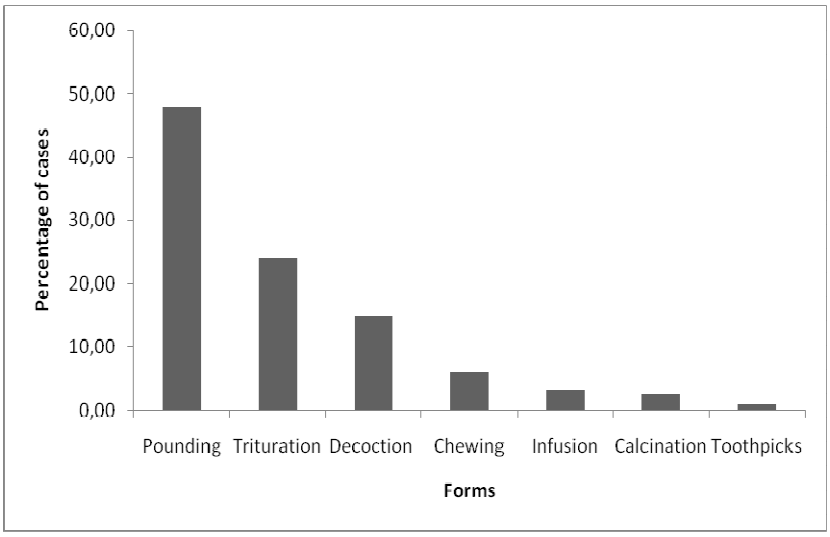

Figure 4 : Forms of uses of *A. senegalenis.*

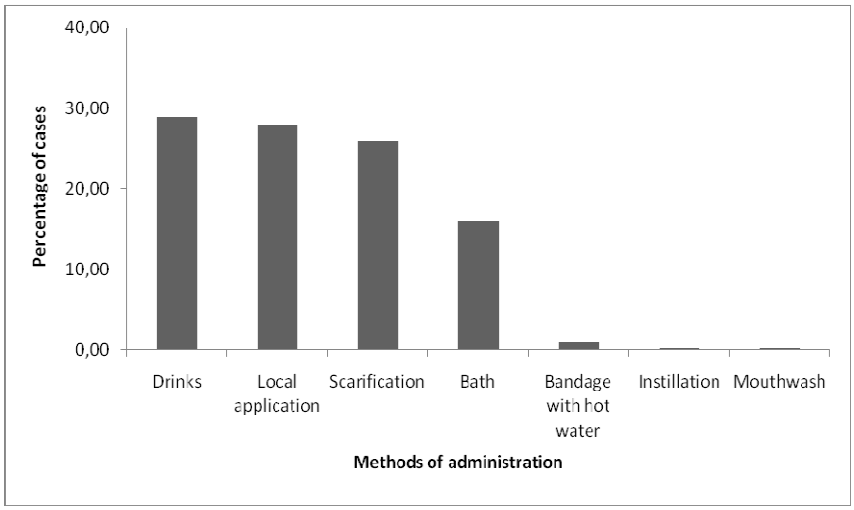

Figure 5 : Methods of administration of *A. senegalenis.*

DISCUSSION

The study reveals that numerous ethnomedicinal uses have been attributed to different parts of *A. senegalensis*, as well as its use as food in Dassa-Zoumé township. Indeed, most of the organs of the plant were used in the recipes for therapeutic preparations. These organs are leaves, flowers, fruits, seeds, bark stem, stem, roots and bark of the root. Okhale et al. (2016) in a literature review on the species found that all parts of the plant have been found useful for traditional medicine applications. In our work, leaves and bark of roots were predominantly used. These results are consistent with those of de Souza (2005) who reported that the leaves and roots were the most used in *A. senegalensis*. Other ethno botanical uses of the plant were mentioned in the literature. Use of *A. senegalensis* for pest control in Nigeria and Tanzania has also been documented (Igoli et al., 2005; Innocent et al., 2014). In the

Republic of Benin, the fresh leaves are spread in poultry houses and left until they are dried for the control of parasites such as fleas and lice (Salifou et al., 2012).

Various forms of pharmaceutical preparations were recorded: decoction, infusion, grinding, calcinations, chewing, vegetable brush and trituration. Grinding, trituration and decoction were the most commonly used methods of preparation. According to Adzu et al. (2005), traditional healers often administer *A. senegalensis* medicines as paste obtained after grinding the fresh roots. The results of this study also showed that medicinal recipes were administered in several forms: bathing of body, drink, dressing in hot water, local application, scarification, instillation and washing of mouth. A medicinal recipe in form of drink was the most used. This result is consistent with that of Ouattara (2006) who reported that during their investigations the method of administration of medicine mostly used was drink.

The analysis of data collected shows that many diseases were cured by *A. senegalensis*. Thus, some organs (stem bark, root bark and roots) possess anti-venomous activity according to some respondents. The anti-venomous activity of the plant was also reported by Dambatta et al. (2011) in Nigeria. From the results of our survey, it also appears that the leaves and roots of this plant were used in the treatment of malaria, sexual impotence, cough, abscess, icterus and rheumatism. These results are consistent with those of Kerharo and Adam (1974) who reported that these organs have febrifuge, bechic, sedative and decongesting properties that is why they are used in the treatment of malaria and rheumatism. The work of Fall et al. (2003) illustrated that roots were used in the treatment of malaria. The use of *A. senegalensis* leaves against abscesses and sexual impotence was also reported by de Souza (2005). *A. senegalensis* was also used to treat wounds, anaemia, diarrhoea, dysentery and arthritis. Similar findings were also reported in the work carried out by Abdullahi et al. (2003). Several studies revealed the antibacterial activity of tannin of *A. senegalensis* extracts on haemorrhage and infections (Elegami et al., 2002). It is likewise with regard to roots, leaves and bark of the stem properties on the stings of bee and wasp. This is because *A. senegalensis* roots and leaves have anti-inflammatory activity (Amadou, 2004).

Conclusion

From the overall results obtained in the present study, it appears that *A. senegalensis* is a plant whose organs are widely used in pharmacopoeia in Dassa-Zoumé township. This plant is found in fallows and arboreous savannah. *A. senegalensis* provides many benefits for people in terms of food, therapy and economy. Traditional healers in particular and people of Dassa-Zoumé in general are familiar with the virtues of the plant and use it to their well-being. Generally, the leaves and roots are the most used in the preparation of medicinal recipes, while the fruits are mostly consumed.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

JB Adjakpa and LE Ahoton initiated the research protocol, supervised data collection, contributed to write the manuscript; FK Obossou and C Ogougbe tested the questionnaires, collected the primary data and conducted the survey, contributed to data analysis. All authors read and approved the final manuscript.

ACKNOWLEDGMENTS

The authors are grateful to respondents and Dassa authorities to have offered their availability for the survey.

REFERENCES

Aba Toumnou L, Dogo S, Kindomihou V, Agbangba CE, Mbacké S. 2012. Medicinal Plants Used In Some Rural Districts in Senegal (West Africa). *Am.-Eurasian J. Sustain. Agric.*, **6**(4): 325-332. DOI:http://www.aensiweb.net/AENSIWEB/aejsa/aejsa/2012/325-332.pdf

Abdullahi I, Winter S, Atiri GI, Thottappilly G. 2003. Molecular characterization of whitefly, Bemisiatabaci (Hemiptera, Aleyrodidae) populations infesting cassava. *Bull. Entomol. Res.*, **93**: 97-106.

Adomou AC, Yedomonhan H, Djossa B, Legba SL, Oumorou M, Akoegninou A. 2012. Etude Ethnobotanique des plantes médicinales vendues dans le marché d'Abomey-Calavi au Bénin. *Int. J. Biol. Chem. Sci.*, **6**(2): 745-772. DOI: http://ajol.info/index.php/ijbcs

Adzu B, Abubakar MS, Izebe KS, Akumka DD, Gamaniel KS. 2005. Effect of *Annona senegalensis* rootbark extracts on *Naja nigricotlis nigricotlis* venom in rats. *Ethnopharmacol.*, **96**(3): 507-513. DOI: https://www.ncbi.nlm.nih.gov/pubmed/15619571

Agbankpé AJ, Dougnon TV, Bankolé HS, Yéhouénou B, Yédomonhan H, Legonou M, Dougnon TJ. 2014. Etude ethnobotanique des légumes feuilles thérapeutiques utilisées dans le traitement des diarrhées au Sud-Bénin (Afrique de l'Ouest). *Int. J. Biol. Chem. Sci*., **8**(4) : 1784-1795.

Ahamide IDY, Tossou MG, Adomou AC, Houenon JG, Yedomonhan H, Akoegninou A. 2015. Diversité, impacts et usages des Loranthaceae parasites de Cola nitida (Vent.) Schott. &Endl. au Sud-Bénin. *Int. J. Biol. Chem. Sci.,* **9**(6): 2859-2870. DOI : http://www.ifgdg.org

Ahossi P, Dougnon TJ, Kiki P et Houessionon J. 2014. Synthèse des activités biologiques et de l'utilisation de *Tridax procumbens* en production animale et en médecine traditionnelle. *Int. J. Biol. Chem. Sci.,* **8**(4): 1476-1884. DOI : http://ajol.info/index.php/ijbcs

Amadou B. 2004. Aire protégée et construction de territoire en patrimoine : l'exemple de l'île de Karey Kopto (Niger). Université de Bordeaux.

Betti JL. 2004. An ethnobotanical study of medicinal plants among the Baka pygmies in the Dja biosphere reserve, Cameroon. *Afr. Stud. Monogr.,* **25**(1):1-27. DOI: http://jambo.africa.kyoto-u.ac.jp/kiroku/asm_normal/abstracts/pdf/25-1/1-27.pdf

Codjia TC, Assogbajo AE, Ekué MR. 2003. Diversité et valorisation au niveau local des ressources végétales, forestières alimentaires du Bénin. *Cah. Agric.,* **12** (5) : 321-331. DOI : http://revues.cirad.fr/index.php/cahiers-agricultures/article/view/30405/30165

Dambatta S, Aliyu B. 2011. A Survey of Major Ethnomedicinal plants of Kano North, Nigeria, their Knowledge and Uses by Traditional Healers, Bayero. *J Pure Applied Sci*., **4**(2):28-34.

de Souza S. 2005. Guide pratique de phytothérapie. 100 plantes médicinales du Bénin. 84 p.

Dhillion SS, Ampornpan L. 2000. Bioprospecting and phytomedicines in Thailand: conservation, benefit sharing and regulation. In *Responding to Bioprospecting: From Plants in the South to Medicines in North*, Svarstad H, Dhillion SS (Eds). Spartacus Forlag: Oslo; 57–75.

Diarra N, Togola A, DenouA, Willcox M,Daou C et DialloD. 2016. Etude ethnobotanique des plantes alimentaires utilisées en période de soudure dans les régions Sud du Mali. *Int. J. Biol. Chem. Sci.,* **10**(1): 184-197. DOI: http://www.ifgdg.org

Ekpendu TOE, Obande OD, Anyogo PO, Attah AD. 1998. Nigerian ethnomedicine and medicinal plant flora-the Benue experience part 1. *Journal of Pharmaceutical Research and Development*, **3**: 37-46.

Elegami AA, Elnino EI, Eltohami MS, Muddathist K. 2002. Antibacterial activity of some species of family Combreataceae. *Phytother. Res.*, **16**: 555-561.DOI: https://www.ncbi.nlm.nih.gov/pubmed/12237814.

Fall D, Badiane M, Loiseau P, Bories C, Gleye LA, Hocquemiller R. 2003. Activité antiparasitaire d'Annonaceae du Sénégal utilisées en médecine traditionnelle. *Dakar Médical*, **48**(2): 112-116.

Fatoumata OO. 2005. Traitement traditionnel des maladies sexuellement transmissible au Mali : Etude de la phytochimie des activités biologiques de *Annona senegalensis* (Annonaceae) et de *Stachytarpheta angustifolia V*ALH. (Verbenaceae). Thèse de Doctorat, Bamako, 237 p.

Igoli J, Ogaji O, Tor-Anyin T, Igoli N. 2005. Traditional Medicine Practice amongst the Igede People of Nigeria. Part II. *Afr. J Trad CAM*, **2**(2): 134-152.

Innocent E, Hassanali A, Kisinza W, Mutalemwa P, Magesa S, Kayombo E. 2014. Anti-mosquito plants as an Alternative or Incremental Method for Malaria Vector Control among Rural Communities of Bagamoyo District. *Tanzania J Ethnobio Ethnomed*., **10**: 56. DOI : http://www.ethnobiomed.com/content/10/1/5.

INSAE. 2002. Recensement Général de la population et de l'Habitat, Résultats Provisoire, Bénin. Rapport, 9 p.

Jiofack T, Fokunang C, Guedje N, Kemeuze V, Fongnzossie E, Nkongmeneck BA, Mapongmetsem PM, Tsabang N. 2010. Ethnobotanical uses of medicinals plants of two ethnoecological regions of Cameroon. *Int. J. Med. Med. Sci.*, **2**(3): 60-79.DOI: http://www.academicjournals.org/journal/IJMMS/article-abstract/07319C876.

Kerharo J, Adam JG. 1974. La pharmacopée sénégalaise traditionnelle. Ed. Vigot frère, Paris.

Koni JM, Bostoen K. 2008. Université libre de Bruxelles (Belgique) Musée Royal de l'Afrique centrale (Tervuren, Belgique), 71 p.

Okhale SE, Akpan E, Fatokun OT, Esievo KB, Kunle OF. 2016. *Annona senegalensis* Persoon (Annonaceae): A review of its ethnomedicinal uses, biological activities and phytocompounds. *J. Pharmacogn. Phytochem.*, **5**(2): 211 -219.

Ouattara D. 2006. Contribution à l'inventaire des plantes médicinales significatives utilisées dans la région de Divo et à la diagnose du poivrier de Guinée : *Xylopia aethiopica* (Dunal) A. Rich. (Annonaceae). Thèse de Doctorat de l'Université de Cocody-Abidjan (Côte-d'Ivoire), UFR Biosciences, Laboratoire de Botanique, 184 p.

Salifou S, Offoumon O, Gouissi F, Pangui L. 2012. Endogenous Recipes for Controlling Arthropod Ectoparasites of Domestic Poultry. *Rev. Bras. Parasitol. Vet. Jaboticabal.*, **22**(1): 119-123. DOI: http://www.cbpv.org.br/rbpv/documentos/2212013/rbpv_v22n1_a21.pdf