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Chemical characterization of *Tectona grandis, Thalia geniculata, Lasiomorpha senegalensis* and of *Musa acuminata* used as food packing's in Benin

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Abstract
Several plant leaves are used like packing in agro alimentary in Benin and play a double role. While acting as packing, they offer an antibacterial protection and/or antifungal to the conditioned food. It is in the research of possible antibacterial potential and/or antifungal of the leaves of *Tectona grandis*, of *Thalia geniculata*, of *Lasiomorpha senegalensis* and of *Musa acuminata* in traditional use as packing for the conservation of food in Benin that the present survey has been led. It aims to make the phytochemical screening of the leaves concerned. From the gotten results, it notices that the non volatile extracts of the plant species tested contain antibacterial compounds (flavonoïdes, tannins) antifungal (quinonic derivative) and no cyanogenic derivatives is present in somes leaves.

Keywords: Phytochemical screening, *Tectona grandis, Thalia geniculata, Lasiomorpha senegalensis, Musa acuminata*

1. Introduction
In agro-food industry, the healthy conservation, of long during and the qualities organoleptiques of the products consumed is a permanent obsession (Holzapfel, 2002; Motarjemi, 2002) [11, 13]. The packing is part of these techniques of conservation of the agro-food products. It is indispensable for its protection, its transportation, its promotion and its use (Palling, 1980,; Paine, 1987,; Rock, 1997) [18, 17, 19]. Modern materials used as packing for food products include a number of articles (wood, paper, glass, plastic, metal). But before and during the modern area in Africa and in all tropical regions the plant leaves served in general and are used to pack the semi-solid or solid food to be preserved and/or marketed (Bureau and Tissot, 1987,; Bureau and Multon, 1989,; Adegunloye *et al*., 2006) [9, 8, 1]. Besides, it has been recognized that some leaves contain the aromatic active compounds, stains, enzymes (papaïne for example), antimicrobial agents that migrate from the plant leaf towards its food and improve its conservation and organoleptiques properties (Buquet and Muff, 1972,; Bramsnaes, 1981). Works listed and characterized a big number of these plant species (Hounhouigans, 2000, Adegunloyes *et al*., 2006; Adejumo and Ola, 2008,; Onzo *et al*., 2013) [12, 1, 2, 16]. There are even an economic and environmental benefit bound to the use of these plant leaves as food packing, especially due to their biodegradability (Onzo *et al*., 2013) [1]. The food craft in Benin has retained the use of a certain plant food packing numbers even in the big cities (Boko *et al*., 1997; Onzo *et al*., 2013) [3, 1]. It is the case of the plant leaves of *Thalia geniculata, Tectona grandis, Lasiomorpha senegalensis* and *Musa acuminata* in traditional use as packing for the conservation of food in Benin. So, did we ask to know if these four plant leaf species used like food packings in Benin don't contain chemical features having an effect antimicrobial and/or antifungal that can protect food for which they serve as packing?

2. Material and Methods
2.1 Criterias of choice of the plant species
The choice of our plant species is based on the works of Onzo *et al*., (2013) [1] in which several species of vegetable plant leaves used as packing for various food categories in Benin have been identified throughout the national territory. Among these species of plant leaves *Thalia geniculata, Tectona grandis, Lasiomorpha senegalensis* and *Musa acuminata* are the main species that are used traditionally in the South of Benin. These species of leaves were chosen for the study, because of the importance of their use by the producers for the packing of foodstuffs such as a stuff derived from starchy corn called *akassa* « *Gui ou lio* in local language fongbe (Nago, 1997 ; Onzo and *et al.*, 2013) [15, 1]. In general, the consumers prefer the akassa wrapped in these leaves that would confer it a good presentation, good texture and good aroma (Onzo *et al*., 2013) [1].

2.2 Collection and drying of the plant material

Collection of the leaves of *Tectona grandis, Thalia geniculata, Lasiomorpha senegalensis* and of *Musa acuminata* has been achieved during September 2014 in the township of Abomey-calavi (latitude/longitude: 6°26′54″ north/2°21′20″ east), department of the Atlantic in the South Benin. These plant species were collected in their natural habitat to know the swampy zones edging the Nokoué lake for *Thalia geniculata* and *Lasiomorpha senegalensis* whereas *Tectona grandis* and *Musa acuminata* have been collected on silty-clay farm land. Taxonomic identification of these leaves was conducted by taxonomists of the National herbarium of the university of Abomey-Calavi using the data available to this effect. They have been dried to the laboratory temperature (25 °C-30 °C) during about two (02) weeks in the shade and away from the sunlight and then powdered.

2.3 Identification of the secondary metabolites

The procedure used for the research of every compound enumerate as follows:

- The gallic tannins has been characterized by an aqueous solution of ferric chloride (FeCl3) to 2% driving to the development of a coloration bruise-black or green black characterizing the presence of tannoïdes;
- The catechic tannins has been put in evidence by the reagent of Stiasny (formalin 30% in HCl extract: 2/1 v/v) (Soro *et al*., 2009) [20];
- The flavonoïdes as for them are revealed by the reaction to the cyanidine (Bruneton, 1999) [6];
- The anthocyanes have been revealed by hydrochloric acid addition to 5% and some drops of ammonia water to infuse it. A red coloration that turns to the purplish or greenish bruise indicates the presence of anthocyanes;
- The leuco-anthocyanes is put in evidence by the hydrochloric alcohol (ethanol to distilled 95° alcool/water; HCl concentrated in proportion equivolumic) and heating to the bath gets married to 90 °C. A coloration red cherry or purplish indicates the presence of leuco-anthocyanes;
- The alkaloids have been identified by the test of Meyer and have been confirmed by the test of Bouchardât (Guessan *et al.,* 2009; Koudoro *et al*., 2014) [14, 24];
- The derivatives quinoniques have been identified by the test of Bornträger (Dohou *et al*., 2003) [10];
- Saponins were determined by the test of moss; degree of dilution of an aqueous décoction giving persistent moss after shaking (Bruneton, 1993,; Dohou *et al*., 2003) [5, 10];
- The steroids have been put in evidence by the test of Liebermann-Burchard (Békro *et al*., 2007) [21];
- The Coumarineses were identified by fluorescence in UV at 365nm (Soro *et al.,* 2009) [20];
- Cyanogenic derivatives were detected by the picric acidic test 1% resulting in a brown coloration characteristic of the presence of cyanogenic derivatives;
- Mucilages were revealed by the obtaining a flaky precipitate of a décoction in ethylic ether indicating the presence of mucilages (Traore, 2010) [22];
- The anthracenosides have been put in evidence by testing in ethanol alkaline with ammoniacal solution. The development of a cherry red color indicates the presence of aglycones anthracenosic.

3. Results and Discussion

Table I present the results of the phytochemical analysis of species of plant leaves used. From the data analysis, it notices that in the non-volatile extracts the tannins have been identified in all species except in the species Musa acuminata where they are represented by trace. Nearly all species contain anthocyanes and leuco-anthocyanes except Musa acuminata. Mucilages are present in all plant species studied. The anthracenosides meanwhile are largely in *T. grandis* and in trace in the other species. In the same way, the flavonoïds have been strongly identified in *T. grandis* species and weakly in other species. Quinonic derivatives and cyanogenic compounds are absent in all plants species studied except in *T.grandis* species in wich we detected the quinonic derivatives in small quantities. Saponins are like quinonic derivatives and cynogénic absent in all the extracts studied investigated except in the extract of *L. senegalensis* in which they are found in small quantities.

Fagbohoun *et al.,* (2013) [25] got similar results for *T. grandis* species for which they affirmed the presence of tannins, flavonoïds, quinones, mucillages and saponins.

About *T. geniculata* species Williams and Harbornes, (1977) cited by Lagnica, (2005) [23] also found similar results; notably the presence of flavonoïdes in this species. In the same way, the works of Watson and Dallwitzes, (1992) [26], rapported in this species the presence of Proanthocyanidins

Table 1: Result of phytochemical screening of plants

Species Compounds	*T. grandis*	*T. geniculata*	*L. senegalensis*	*Musa sp.*
Tanins galliques	+	+	+	±
Tanins catechic	+	+	+	+
Flavonoïdes	+	-	-	+
Anthocyanes	+	+	+	-
Leuco-anthocyanes	+	+	+	-
Derivative quinoniques	+	-	-	-
Saponines	±	±	+	-
Cyanogenic Derivatives	-	-	-	-
mucilages	+	+	+	+
Anthracénosides	+	±	±	±

+ : presence ; - absence ; ± : trace

The table II presents the biologic properties of the chemical compounds being in the plant species. To the look of the information of the table II, all species of plants whose extracts contain the tannins, the flavonoïdes, the derivatives quinoniques, the Saponosides, the Terpèneses and the steroids are antiseptics and therefore of the potential candidates capable to act as packing susceptible to play a role in the conservation of food. It is therefore by order about priority of *T. grandis, T. geniculata, de L. senegalensis et de Musa acuminata*. All these species contain at least an antibacterial, an antiviral and/or one fungicide. Except the effects biocides all our four studied plant species contain the food complements being able to play a role antioxidant, anti-inflammatory, antiallergique, antitumoral, vasculoprotecteur and/or vein trope also.

Table 2: Biological properties of compounds chemical

Chemical compounds	Main biologic and pharmaceutical properties
Alkaloids	central nervous system: depression or stimulation - autonomic nervous system: action sympathomimétique or sympatholytique - action curarisante, local anesthesia (cocaine), anti-tumorous, antipaludique
Tanins	Healing, antibacterial, antiseptic, antioxidant, enzymatic inhibition, 5-lipo oxygénase, enzyme of conservation of the angiotensine,
Flavonoïdes	- Effect vasculoprotecteur and veinotrope: decrease the permeability of the blood capillaries and reinforce their resistance - Anti-inflammatory property and antiallergique by inhibition of 5-lipooxygénase, the cyclo oxygénase and the aggregation plaquettaire. - Antibacterial, in vitro antiviraux
Derivatives quinonic	- Antibacterial and fungicide (naphtoquinone), cytotoxique - Laxative (derivative 1,8-dihydroxyantracénique), allergisan
Saponosides	- Antibacterial, antiseptic and antiviral - Hémolytique, toxic ichthyo, molluscicide,
Terpènes et stéroïdes	Cytostatique, antivirale, analgesic, anti inflammatory and antiseptic.
Derivatives cyanogenic	Toxicity due to the production of ions cyanides
Hétérosides cardiotoniques	-cardiotonique : inotrope positif, chronotrope négatif, dromotrope négatif -toxicité cardiaque

(Bruneton, 1999) [6]

4. Conclusion

The present survey consisted in making the screening phytochimique of the excerpts non volatile of the leaves of *Tectona grandis*, *Thalia geniculata, Lasiomorpha senegalensis* and of Idled about cultivated *acuminata* in Benin to search for the reasons of their use in agroalimentary as plant packing. Of the chemical profile to establish, one can keep between other the presence of Tannins galliques, Tannins catéchiques, mucilages and of the Anthracénosideses in the non volatile excerpts gotten by steeping of these plants. These molecules possess the properties antimicrobiennes and organoleptiques very appreciated and will be coveted very in agroalimentary and justify the empiric use of the leaves of these plant species as packing in Benin. Besides, these potentialities antimicrobiennes and organoleptiques hardly interviews open interesting perspectives of research for the years to come. It will be about improving the length of traditional conservation of food wrapped while acting on the technological diagram in order to promote these plant packings for and on behalf of the plastic synthetic packings that pollute the environment.

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