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Preservative effect of *Scyphocephalium ochocoa* warb on edible tubers and seeds

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Abstract
Food preservation is one of the essential concerns in food safety because food constitutes favorable environments for the growth of microorganisms responsible for food poisoning. To combat the fungi and bacteria that attack food, different types of treatments are used. These include, among other things, chemical fungicides that have been shown to be effective. However, their high cost, the persistence of residues in food, the appearance of strains resistant to fungicides, the negative impact of chemical treatments on health and the environment and the lack of expertise in the handling of pesticides by some. Mean that special attention should be paid to non-chemical control methods.
Thus, extracts of the bark, leaf and seed of *Scyphocephalium ochocoa* were tested to evaluate their antifungal action against molds of tubers and food seeds.
The results obtained show that in the presence of the aqueous and methalonic extracts of the leaves and bark of *Scyphocephalium ochocoa*, mold growth did not occur after 21 days of experience.
Ultimately, the leaves and bark of *Scyphocephalium ochocoa* can be a tool for preserving food.

Keywords: preservation, mold, foodstuff, *Scyphocephalium ochocoa* warb

Introduction
Tubers are food plants of primary importance in many tropical countries, whether they are located in Asia, South America, Africa or particularly in Central Africa. Tubers (yam, cassava, potato, taro, potato) are rich in starch and therefore a source of food energy. They are also an important source of income for the people who cultivate them [1]. Conservation losses represent a serious shortfall for agriculture and traders. Post-harvest losses are usually due to insects, nematodes, rodents, evaporative water loss and microorganisms [2]. Rots caused by fungi cause the greatest storage losses [3]. Fungi generally associated with rots during storage are *Aspergillus flavus* Lark ex Fr., *A. niger* Van Tiegh, *Botryodiplodia theobromae* Pat, *Fusarium oxysporum* Schlecht ex Fr., *F. solani* (Mart.) Sacc., *Penicillium chrysogenum* Thom, *P. oxalicum* Currie and Thom, *Rhizoctonia* spp., *Trichoderma viride* Pers. ex S. F. Gray and *Rhizopus nodosus* N'amyslowski [4, 5]. One of the important criteria which determines the sanitary quality of tubers is contamination by mycotoxins. The presence of molds and toxins in food has become a matter of concern to health professionals, as well as to global commerce. The resurgence of diseases due to food contaminated by pathogenic molds in urban and rural areas is clearly increasing. So, to fight against molds and bacteria that attack tubers, different types of treatments are used. These include, among other things, chemical fungicides that have been shown to be effective. However, chemical control has many drawbacks such as high cost, the persistence of residues on treated tubers, the emergence of strains resistant to the fungicides used and the negative impact of chemical treatments on health and the environment. There is also the lack of expertise in handling pesticides by farmers. In recent years, special attention has been paid to non-chemical control methods, which leads people to turn to herbal medicine to find a solution to their health problem. This is how plant powder extracts, thanks to the active substances they contain, are increasingly used to fight against plant pathogens. *Scyphocephalium ochocoa* Warb used as a food and medicinal plant [6-8] has been tested against tuber rot fungi. Biological control of pathogens responsible for plant diseases seems to be a promising alternative that can be used in post-harvest [9]. against fungi responsible for tuber rots. The objective of this work is to test the sensitivity of the tubers of; sweet potato, taro and potato, with mold. These tubers are treated with the bark, dried leaves, raw seed of *Scyphocephalium ochocoa* Warb. The interest of this study is to show that the protection and preservation of food can also be done from products derived from plants.

Materials and Methods
Plant material
The seeds, leaves and bark of *Scyphocephalium ochocoa* were collected at the Sibang arboretum in June 2016. These samples were identified at the National Herbarium of the Institute of Pharmacopoeia and Traditional

Medicine (IPHAMETRA), Libreville, Gabon. Some of the samples were deposited at the IPHAMETRA Herbarium and the analyzes were carried out at the IPHAMETRA laboratory.

Samples preparation

The aqueous and methonic extracts were prepared by mixing 5g of *Scyphocephalium ochocoa* powder with 40ml of distilled water or methanol. The mixture was stirred for 15 minutes. Then, from the aqueous or methanolic filtrates obtained, the tests were carried out. The filtrates were stored at 4 ° C in a refrigerator.

The powders were obtained from the seeds, leaves and bark of *Scyphocephalium ochocoa*. The seeds, leaves and bark were placed in an oven at a temperature of 25 ° C for 15 days and 7 days respectively for drying. The seeds, leaves and bark were pounded separately in a porcelain bowl for about 10 minutes. Thus, 3 types of powders were obtained: seed powder, leaf powder and bark powder.

Phytochemical screening

Each extract was then tested for the presence of flavonoids, tannins, saponosids, reducing sugar, anthocyans and alkaloids as described elsewhere [10, 11].

Preservative effect test

Tubers and grains were impregnated with 5g of powder. These batches were divided into four batches and a control batch not impregnated with powder, a batch impregnated with seed powder, a batch impregnated with leaf powder, and a batch impregnated with bark powder. The raw and cooked beans were also impregnated with the aqueous and alcoholic extracts of *Scyphocephalium ochocoa* from the various powders. The experimental batches were placed on plates in the ambient air in an unconditioned room of the laboratory. Observations were made every three days.

Results

Phytochemical screening

The results of the phytochemical screening are reported in Table 1. According to these results, only the tannins and the reducing sugars are present in the aqueous and methanolic extracts of *Scyphocephalium ochocoa*.

Table 1: Phytochemical screening results

Families of Molecules	Aqueous extracts		Methanolic extracts	
	Untreated seed	Treated seed	Untreated seed	Treated seed
Flavonoids	–	–	–	–
Anthocyanins	–	–	–	–
Alkaloids	–	–	–	–
Reducing sugars	–	+	+	+
Tannins	+	–	+	+

Significant presence ++; Average presence +; Absence:-

Preservative effect

Table 2 summarizes the preservative effect of powdered seeds, leaves and bark of *Scyphocephalium ochocoa* on tubers and seeds. According to these results, the powders of bark and leaves preserve the tubers and seeds of squash well by preventing the growth of molds: these powders therefore exert an antifungal activity. In fact, the data obtained on the potato show that the control tuber shows signs of rotting 21 days later, whereas the potato, impregnated with powder from the seeds, leaves and powder of the bark of *Scyphocephalium ochocoa*, does not show of rotting after a month.

Table 2: Preservative effect of *Scyphocephalium ochocoa* on tubers and seeds.

		Witness	*Scyphocephalium ochocoa*		
			Seed powder	Leaf powder	Bark powder
Tubers	Potato	++	+	-	-
	Taro	++	+	-	-
	Yam	-	-	-	-
Seeds	Peanut		++	++	++
	Maize		-	++	++
	Squash		-	-	-
	Pais odika		-	-	-

Significant presence of mold ++; Average presence of mold +; Absence of mold:-

Table 3 shows the effect of *Scyphocephalium ochocoa* on the contamination of raw and cooked bean seeds. According to these results, the powder is very active in preserving raw or cooked beans. This result confirms the antifungal effect of *Scyphocephalium ochocoa* powder.

Table 3: Effect of *Scyphocephalium ochocoa* on the contamination of raw and cooked bean seeds

	Powder	Aqueous extract	Alcoholic extract
Raw bean	-	+/-	-
Cooked bean	-	++	+

Significant presence of mold ++; Average presence of mold +; Absence of mold:-

Discussion

Food contamination is a major constraint, especially for the tuber sector, which is of great economic importance. To do so, faced with these contaminations, the use of fungicides in packaging lines has long become routine. In the markets, food products are stored in stores which are not up to standard. The high humidity in these places is the major drawback. This storage method promotes the development of molds and bacterial fermentation phenomena [12]. A study on the comparison of the antifungal activity of the leaves and bark of the trunk of Pteleopsis suberosa G. showed that plants very rich in tannins had a more active antifungal activity [13]. Another study showed that tannins and related compounds have weak antimicrobial activity when dilution is moderate [14]. The work of Tchouya *et al*, 2015 and Ngoua-Meye Misso *et al*, 2018 highlight the strong presence of tannins but also of other compounds such as anthocyanins, flavonoids, coumarins and triterpenes. in different parts of *Scyphocephalium ochocoa* [6, 8]. The absence of rotting on potatoes impregnated with seed powder, leaves and bark powder of *Scyphocephalium ochocoa* after one month suggests that the effect of tannins and other compounds in the leaves and bark of *Scyphocephalium ochocoa* is more important than that present in the almond richer in organic substances such as fat. The tannins present many properties they make the materials rot-proof and have an antifungal and antibacterial power.

Sclerotinia is one of the molds responsible for rotting potatoes and their inhibition by the action of *Scyphocephalium ochocoa* powders show the effectiveness of this plant. The results of the present study indicate a certain interest insofar as the potato can be preserved for one month after impregnation of the powder of the leaves and of the powder of bark, ie 0.5 g.

The control taro does not show signs of wilting until after 35 days and when induced with powders its shelf life is one and a half months. Wilting is a loss of water. *Scyphocephalium ochocoa* powders seem to have an action on the enzymes of the taro skin thanks to its astringent properties. In fact, according to data from the literature, tannins have an inhibitory activity on enzymatic systems. They are also vasoconstrictors.

However, the sweet potato remains intact until the end of the experiment; no tuber rots. Yet it is threatened by several types of biotic and abiotic stresses, especially the extensive damage caused by viral, bacterial and pest diseases [15]. The sweet potato is attacked by many diseases of various origins which are in particular caused by viral agents. Viral diseases generally called SPVD (sweet potato virus disease) are the most important diseases in Africa and probably in the world [16].

The results obtained in the rainy season allow us to say that the climatic factors, precisely the temperature as well as the humidity of the air, have an impact on the conservation of tubers. Indeed, we note that the tubers keep longer in the dry season than in the rainy season. We only observed the rotting of the control potato from September 2016 for an experiment set up in August 2016 with an average relative humidity of 25% at that time and an average temperature of 29°C and that was the only case. In fact, the sweet potato impregnated with powdered bark is intact until November 2016, which is the same case for the potato impregnated with powdered leaves. That is to say a gain of at least five months. On the other hand, in the rainy season, the results obtained show that the time saved thanks to *Scyphocephalium ochocoa* is about one month.

These results are similar to those obtained by Nguyen, 2007 who worked on rice and who said that the proportion of grains contaminated by mold in the rainy season (18.7%) is higher than in the dry season (13,5%).

Storage molds of the genera *Penicillium*, *Aspergillus* and *Eurotium* are dominant in all samples examined. During the rainy season, the proportion of samples contaminated with *A. parasiticus* is high (60%). Out of fifty samples, more than half (54%) of the samples are contaminated with *P. citrinum*, and 7% are contaminated with *A. niger* 14% are simultaneously contaminated with *A. versicolor* and *A. parasiticus* [17]. Compared to the experiment carried out in the rainy season, the tubers sprayed with bark powder and leaf powder are well preserved until the end of our experiment; however, those which were sprinkled with almond powder rotted.

Conclusion

These results indicate that the leaves and bark of *Scyphocephalium ochocoa* are best suited for preserving food.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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