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Evaluation of the antioxidant and photoprotective activity of *Xylopi*a *langsdorffiana* St-hill & Tul.

Rodrigo Silva de Andrade^{1,*}, Diego Igor Alves Fernandes de Araújo¹, Yuri Manguiera do Nascimento¹, Josean Fachine Tavares¹ and Marcelo Sobral da Silva¹

¹ Postgraduate Program in Natural and Synthetic Bioactive Products, Health Sciences Centre, Federal University of Paraíba, João Pessoa, PB, Brazil; E-Mail: rodrigo@lft.ufpb.br; diego_igor@lft.ufpb.br; yurimanguiera@lft.ufpb.br; josean@lft.ufpb.br; marcelosobral@lft.ufpb.br

* Author to whom correspondence should be addressed; E-Mail: rodrigo@lft.ufpb.br; Tel.: +55-083-111-111.

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Abstract: The genus *Xylopi*a is widely distributed in Brazil with several species used in folk medicine. Among them, *Xylopi*a *langsdorffiana* (“pimenteira-da-terra”), which has several secondary metabolites such as alkaloids, diterpenes and flavonoids. In addition, pharmacological studies have already been carried out, demonstrating that this species has cytotoxic, gastroprotective, cicatrizing and spasmolytic activity. However, no studies have been done regarding its antioxidant and photoprotective activities. In order to contribute to the knowledge of this species, the antioxidant and photoprotective activity of its crude ethanolic extract (CEE) was evaluated. In order to test antioxidant activity *in vitro*, the radical scavenging method (DPPH) was used and the results obtained were expressed in EC₅₀. The content of total phenolic compounds was determined using the Folin-Ciocalteu method and to determine the amount of total flavonoids was used the colorimetric method with AlCl₃, where all analyzes were done in triplicate. To determine the photoprotective activity, the maximum absorbance technique was used, and it was possible to calculate the sun protection factor (SPF) *in vitro*. *X. langsdorffiana* CEE presented EC₅₀ = 575.01 ± 6.50 µg/mL and did not reach the required minimum value of <500 µg/mL to be considered active. The total phenolic content was 48.34 ± 1.64 mg EAG/g and the flavonoid content of 25.10 ± 2.62 mg querc./g, demonstrating that most of its phenols are flavonoids, and despite obtaining a significant quantity of flavonoids, they may not be related to antioxidant activity. In the evaluation of the photoprotective activity the CEE presented SPF with a value of 2.27 and was considered insufficient to perform activity. Despite having a significant amount of total flavonoids, the extract did not present good antioxidant and photoprotective activities, demonstrating that the presence of flavonoids in an extract does not necessarily imply good antioxidant and photoprotective activities.

Keywords: Antioxidant; photoprotection; *Xylopi*a

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1. Introduction

Xylopi genus (Annonaceae) contains about 160 species with pantropical distribution, being the most well distributed among the Annonaceae family, with presence of approximately 50 species in Brazil (Dias, 1988; Chatrou et al., 2012; Maas et al., 2013). *Xylopi* *langsdorffiana* St-Hil & Tul. is a tree with 5-7 m of height that has alternating leaves with purple flowers. It is popularly known as “pimenteira-da-terra” (Correa, 1984).

There are many reports about the phytochemical composition of *X. langsdorffiana*, such as diterpenes, alkaloids and flavonoids (Tavares et al., 2007; Silva et al., 2009) and pharmacological activities, like cytotoxic, spasmolytic, healing and gastroprotective (CASTELLO-Branco et al., 2009; Moura, 2012; Martins et al., 2013;).

Despite the various studies on this specie, and the range of compounds isolated, no study has been done so far on its antioxidant and photoprotective activity. Therefore, the objective of this work was to evaluate the antioxidant and photoprotective activity from the leaves of *Xylopi* *langsdorffiana*.

2. Results and Discussion

In the determination of the antioxidant activity, were used the concentrations of 250, 300, 400, 550 and 600 µg/mL for *Xylopi* *langsdorffiana* and the ascorbic acid standard was 2.5, 5.0, 10, 15 and 20 µg/mL, these concentrations were determined by initial screening. From these concentrations, the EC₅₀ was determined. For *X. langsdorffiana* it was 575.01 ± 6.50 µg/mL, and for the standard 26.84 ± 0.36 µg/mL, both presenting a coefficient of variation <5%, showing the efficacy and precision of the method. The EC₅₀ value did not reach the required minimum (<500 µg/mL) to be considered active. Thus, it may be suggested that the CEE of *X. langsdorffiana* leaves does not have a good antioxidant activity.

The total phenolic content was 48.34 ± 1.64 mg EAG/g and the flavonoid content was 25.10 ± 2.62 mg querc/g, demonstrating that most of its phenols are flavonoids, and despite obtaining a significant quantity of flavonoids, they may not be related to antioxidant activity (Evans et al., 1996; Pourmorad et al., 2006).

In the determination of the sun protection factor (SPF), the CEE of *X. langsdorffiana* presented a value of 2.27, and according to the legislation of the National Agency of Sanitary Surveillance (ANVISA), the sunscreens to be considered active, must present at least an SPF of 6 in preliminary tests. As the CEE did not obtain the minimum value, it may be suggested that it has no protective filter potential.

3. Materials and Methods

The leaves of *Xylopi* *langsdorffiana* were collected in the city of Cruz do Espírito Santo, Paraíba, Brazil, in December of 2010. The plant materials were dried at temperature of 40 °C, for 96 hours, and then powdered in a mill.

Obtaining plant extracts

The leaves of *Xylopi* *langsdorffiana* were submitted to an extraction process by maceration method, with ethanol 95%. Three extractions were developed, replacing the solvent every 72 hours. The extraction solution obtained was submitted to rotary evaporator at an average temperature of 40 °C.

Determination of antioxidant activity *in vitro* by the radical sequestering method (DPPH)

To perform the antioxidant activity test, it was used the methodology described by Garcez et al. (2009) with some adaptations. The antioxidant activity was expressed as EC₅₀, and ascorbic acid was used as standard. The sample is considered active when it presents EC₅₀ < 500 µg/mL (Campos et al., 2003). All samples were performed in triplicates.

Determination of total phenolic compounds and total flavonoids

The content of total phenolic compounds (TPC) was measured based on the Folin-Ciocalteu method (Cabral et al., 2009) and the total flavonoids (TF) were determined using the colorimetric method by metallic complexation described by Schmidt and Ortega (1983). All samples were performed in triplicates.

In vitro determination of the sun protection factor (SPF)

The SPF was determined using the spectrophotometric method developed by Mansur et al. (1986).

4. Conclusions

Although studies have reported the presence of flavonoids in the specie *Xylopia*

langsdorffiana, and that in this study it was found that it obtained a significant amount of total flavonoids, the extract did not present good antioxidant and photoprotective activities, demonstrating that the presence of flavonoids in an extract does not necessarily imply good antioxidant and photoprotective activities.

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Conflicts of Interest

The authors declare no conflict of interest.

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