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Phytochemical Composition and Antioxidant Activity Screening of Extracts from the Leaf of *Emilia coccinea* (SIMS) G.don

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Abstract: *Emilia coccinea (Sims) G.Don, is widely used in folkloric medicine for the treatment of tumors, inflammation, cough, rheumatism, fever, dysentery, wounds and in the prevention of some health challenges. However, little is known of their actual phytochemical content concerning their various medicinal and pharmaceutical applications. In this study, preliminary and quantitative phytochemical properties of E. coccinea leaves were evaluated using recommended analytical procedures. The results obtained indicated the presence of bioactive compounds such as flavonoids (0.57 ± 0.01), alkaloids (3.87 ± 0.02), tannins (0.15 ± 0.01), saponins (0.39 ± 0.02) and phenols (0.43 ± 0.01). The high concentration of alkaloids and moderate concentration of other phytochemicals proved that E. coccinea extract has some potential for pharmaceutical applications. E. coccinea leaves extract also exhibited significant antioxidant activity at a minimum and maximum concentrations of 2.0 and 12.0 mg/ml respectively (compared to the ascorbic acid used as a standard free scavenger). The component identified in the plant has established literature on its medicinal and physiological associated benefits.*

Keywords: Phytochemicals, *Emilia coccinea*, antioxidant, free radicals, plant extract.

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1.0 Introduction

The use of extracts of various plants in the treatment of some diseases has long been known and legalized in some countries. Consequently, increasing research interests have dominated the use of natural products of plants origin in ethnomedicine. (Igwe and Echeme, 2013). Medicinal plants are rich in several biologically active compounds including nutrients, phytochemicals and others. These compounds have physiological impacts on the human body while their active ingredients are sources of raw materials for the formulation of some pharmaceuticals. (Igoli *et al*., 2005; Igwe ., 2014).

Recent research conducted by Obadoni *et al.* (2001) revealed that plants are an embodiment of essential bioactive molecules from nature especially, carotenoids, flavonoids, vitamins, dietary fiber, minerals, amino acids, and prebiotics. Edeoga *et al.*,2005 and Igwe *et al.*,2013) reported that plants derive their medicinal property from these bioactive chemical compounds. In Nigeria, two-thirds of her population is reported to be dependent on herbal medicine for their primary health care due to the prevailing factors such as cultural acceptability, better compatibility and the belief that have better adaptability in the human systems than the chemical drug, which are commonly regarded as toxic to some extent various (Asongalem*et al.*, 2004). However,

most of these factors have not been scientifically established. Current progress in drug discovery through green technology requires chemical assay of their compositions and tested toxicity, efficacy, and other factors. Much is known about the traditional application of *Emilia coccinea* in the treatment of several medical problems but little is known about the actual chemical constituents of some plants. Therefore the present study is aimed to analysed and test the medicinal efficacy of this plant.

Emilia coccinea is reportedly used in folkloric medicine for the treatment of tumors, inflammation, cough, rheumatism, fever, dysentery, wounds and in preventing miscarriage. (Teke*et al.,* 2007, Ojiako*et al.*, 2015 and Nwachukwu *et al.*, 2017). The juice of the edible leaves is reportedly used in treating eye inflammations, night blindness, and earaches. (Kamboj and Sulaj 2011).

2.0 Materials and Methods

E. coccinea leaves were collected along roadsides in Osusu (Isiala-Ngwa North local government area in Abia State, Nigeria) between September and March 2020. The plant material was identified and authenticated by a plant taxonomist (Mr. I. K. Ndukwe) in the Plant Taxonomy section of the Forestry Department, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

2.1 Sample preparation and extraction

The leaf samples were thoroughly washed with distilled water and allowed to dry in the air to constant weight before milling with an electric blender. Extraction of the sample was done using the maceration method as described by Farooq (2013).

2.2 Determination of phytochemicals

Alkaloids and phenols were determined according to the method reported by Harborne (1973) while tannin was determined using the method reported by of Van-Burden and Robinson (1981). Saponin was determined using the method reported by Obadoni and Ochuko (2002). Flavonoids were determined according to the method ~~of~~ Boham and Kocipia (1994) adopted. Ascorbic acid was determined using the method recommended by the Association of Vitamin Chemists and modified by Kirk and Sawyer (1991). The B-complex vitamins (thiamine, riboflavin, and niacin) were analyzed through the SKALAR Analyzers method of Barakat *et al.* (1993) while carotenoid was determined according to the method described by James (1995). The macro and micro elements comprising potassium, sodium, magnesium, calcium, phosphorus, nitrogen, iron, copper and zinc were determined according to the method of Shahidi *et al.,* (1999). Protein, crude fibre, lipids, ash and moisture were determined by the method described by James (1995).

2.3 Anti-oxidant activity determination

The free radical scavenging activity of the oil fraction of the sample extract was determined using the 1, 1-diphenyl-2-picrylhydrazyl (α, α-diphenyl-β-picrylhydrazyl; DPPH) method which is described by Man-zocco *et al* (1998). 1.0 g of DPPH, a stable radical was dissolved in 100 ml of methanol. 3.0 ml of different concentrations of the test samples were added to 3.0 ml of a 0.004 % methanol solution of DPPH and incubated for 30 minutes at room temperature. The decrease in absorbance of the solution brought about by the test samples was measured at 517 nm using a spectrophotometer. Ascorbic acid, which is a known antioxidant, was used as a reference standard. The radical scavenging activity was calculated as the percentage inhibition of DPPH discoloration using the equation 1

$$\%\ Inhibition = \frac{A_{Blank} - A_{Sample}}{A_{Blank}} \times \frac{100}{1} \quad (1)$$

where A_{Blank} is the absorbance of the control and A_{Sample} is the absorbance of the test sample

3.0 Results and Discussions

The phytochemical composition of the leaf extract of *E. coccinea* is recorded in Table 1. The results obtained indicated the presence of tannins, flavonoids, saponins, phenols and

alkaloids. Table 1 shows the phytochemical composition of *E. coccinea* leaf extract. The quantitative phytochemical analysis is very useful in the evaluation of some active biological components of some plants. The flavonoid content of the sample was 0.57 ± 0.01 %. Foods rich in flavonoids can reduce the risk of heart diseases, cancer, stroke, and obesity and also lower blood pressure in hypertensive subjects (Galleano *et al*., 2012). Several reports have shown that flavonoid possesses antioxidant, anti-inflammatory, anti-microbial, cardioprotective, neuroprotective effects**,** anti-allergenic, anti-atherogenic**,**anti-thrombotic and vasodilatory effects (Igwe and Okwu, 2013)**.**

Table1: Phytochemical composition of *Emilia coccinea* leaf

Parameters	Composition (%)
Flavonoids	0.57 ± 0.01
Tannins	0.15 ± 0.01
Saponins	0.39 ± 0.02
Alkaloids	3.87 ± 0.02
Phenols	0.43 ± 0.01

**** means ± standard deviation of three determinations**

The mean tannin content of the sample was 0.15 ± 0.01 %. Tannins are useful in medicine because of their astringent properties. The presence of tannins in the leaf extract of *E. coccinea* makes it responsible for binding and precipitating protein and other organic compounds including amino acids and alkaloids (Igwe and Onuoha, 2016).

The mean concentration of saponin in the sample was 0.39 ± 0.02 %. Saponins are known as anti-nutritional phytochemicals that possess the potential to reduce the uptake of certain nutrients including cholesterol and glucose at the gut through intraluminal physiochemical interaction suggesting a possible use in the treatment of diabetes and cardiovascular-related diseases (Manach*et al*., 2005).

Alkaloid was also present in the sample with a mean concentration of 3.87 ± 0.02 %. *E. coccinea* is rich in alkaloids and can be used in the prevention and treatment of infections, relief of pain and cancer prevention. It can also be used in the prevention and management of diseases such as dementia, depression, anxiety, stroke, Alzheimer's and Parkinson's diseases since alkaloids exhibit neuroprotective activity (Friday *et al.*,2018). The mean concentration of phenol in the sample was 0.43 ± 0.01 %. Phenolicsexhibit several properties beneficial to humans and their antioxidant properties are important in determining their role as protecting agents against free radical-mediated disease processes (Kocheet *al.*, 2016).

Table 2: Antioxidant determination of *E. coccinea* leaf

Concentration (mg/ml)	Ascorbic acid	*E. coccinea* crude extract
2.0	7.35 ± 0.02	4.93 ± 0.01
4.0	11.30 ± 0.08	8.97 ± 0.02
8.0	20.90 ± 0.05	13.01 ± 0.03
10.0	22.57 ± 0.01	13.43 ± 0.02
12.0	24.08 ± 0.02	17.50 ± 0.04

**** Mean of three determinations ± SD**

Reactive oxygen species can lead to oxidative damage of some biological molecules such as molecules are implicated in various diseases such as cardiovascular diseases, cancer, stroke and chronic inflammation (Pisoschi *et al*., 2009; Hou and Kumamoto, 2010). Oxidative lipids, proteins and deoxyribonucleic acid (DNA). Oxidation of these biological

stress has also been linked to various lung disorders such as asthma, chronic obstructive pulmonary disease and tuberculosis (Shastri *et al*., 2018).

E. coccinea leaves extract exhibited significant free radical scavenging activity at a minimum and maximum concentrations of 2.0 and 12.0 mg/ml compared to the ascorbic acid used as a standard free scavenger as shown in Table 2. DPPH acts as a stable free radical and gives a strong absorption band at 517 nm in the visible region. When the odd electron becomes paired off in the presence of a free radical scavenger, the absorption reduces and the DPPH solution is decolourised as the colour changes from deep violet to yellow. The degree of reduction in absorbance measurement is indicative of the radical scavenging (antioxidant) power of extract. The presence of flavonoids, saponins and tannins in the leaf extract of *E. coccinea* could be responsible for the free radical scavenging activity observed. These facts suggest that the leaves of *E. coccinea* could be employed in the management of health challenges mediated through oxidative stress and free radical activities (Igwe and Akabuike, 2016).

4.0 Conclusion

From this research, it was noted that the leaves of *Emilia coccinea* is endowed with phytochemicals such as alkaloids, tannins, flavonoids, saponins and phenols. Free scavenging activity exhibited by the leaf lends credence to its importance in the nutraceutical and pharmaceutical industries.

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