ChemSearch Journal 9(1): 9 – 12, June, 2018
Publication of Chemical Society of Nigeria, Kano Chapter

Received: 02/02/2018 Accepted: 07/03/2018

Launaea taraxacifolia; a Neglected Vegetable from Nigeria, its Anti-inflammatory and Antioxidant Activities

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ABSTRACT

Part of health care structures globally are medicinal plants; these are very commonly employed against array of diseases in developing countries like Nigeria. Wild lettuce (*Launaea taraxacifolia*) is grown mostly in West Africa, it is call "Efo Yarin" in Yoruba Language of Nigeria. This plant is commonly used as leafy vegetable, soup and sauces but its medicinal potentials are untapped. The goal of this study is to evaluate the antioxidant and anti-inflammatory activity of the leaves of *L. taraxacifolia.* Its antioxidant activity was tested by 2, 2′-azino-bis-(3-ethyl) benzothiazoline-6-sulfonic acid (ABTS) and anti-inflammatory disposition by employing inhibitory of lypoxygenase. The IC_{50} value for the anti-inflammatory activity of the extract is significant (30.06 µg/mL) when compared with that of the positive control 25.25 µg/mL (Indomethacin), the extract showed a good antioxidant effect with an IC_{50} of 70.59 µg/mL, ascorbic acid was used as a positive control (62.83 µg/mL). This study makes available new insights on the use of *L. taraxacifolia*, a commonly used medicinal plant in many countries of West Africa. The phytochemistry of this wild vegetable is largely unknown except for few screening done by few authors.

Keywords: *L. taraxacifolia;* ABTS, lypoxygenase; anti-inflammatory and Wild lettuce

INTRODUCTION

Since ancient times, humans have valued medicinal plants as a source for medicine against various ailments and diseases confronting (Gurib-Fakim, 2006). The therapeutic disposition of these medicinal plants have been extensively employed in various long-established medical i.e. Ayurvedic, Africa, Chinese and Unani (Schippmann *et al.*, 2006; Uniyal *et al.*, 2006). The presence of secondary metabolites in these medicinal plants is responsible for this healing properties (Lovkova *et al.*, 2001). Nowadays, research on medicinal plants research is receiving keen attention around the world and there is serious effort directed into looking for new biologically active compounds and different constituents from plants, their crude extracts of plants (Bello *et al*., 2017).

Launaea taraxacifolia (synonymous to *Lactuca taraxacifolia*) is a greenish leafy vegetable that is cultivated mainly in the Western part of Nigeria. Though it is also locally cultivated in Senegal, Ghana, Dahomey and Sierra Lone (Adebisi, 2000). It is also known as African lettuce or wild lettuce. The plant is called various names in Nigeria and other West Africa countries. In Nigeria, Hausa tribe call it 'Namijin dayii, Nomen barewa and Nonan Barya' while Yoruba tribe call it 'Efo Yanrin and Odundun Odo'. It is a wild plant that grows singly or in clusters on field, rocky soil, banks and waste places. Beside, being commonly used as vegetable, it is also used as salad, cooked in soup and sauces. The leaves of this medicinal plant are fed to lactating cows in some parts of Nigeria to increase their milk production; it aids multiple gestation rates in ruminant animals i.e. sheep and goats (Burkill, 1985). In the traditional medicine, its leaves are also used on the limbs of little children to help in walking and mixed with ashes against yaws (Ayensu, 1978).

In this study, its purpose is to give the scientific justification for the traditional use of the leaves of *L. taraxacifolia* for anti-inflammatory and antioxidant activities. To the best of our knowledge this is the first assessment of anti-inflammatory activity of this wild vegetable plant.

MATERIAL AND METHODS

Collection and Preparation of Plant Materials

Fresh green plants of *Launaea taraxacifolia* was obtained in December, 2016 from 'Oja- Oba' market in Ilorin, in Kwara State of Nigeria located in the rain forest zone on latitude 10^{o} 00' North of the Equator and longitude 8^{o} 00' East of the Greenwich Meridian. The plant was identified and authenticated at Plant Biology Department, University of Ilorin. The plant materials were air-dried at ambient temperature for two weeks. After drying, the leaves were crushed into fine powder using a ceramic pestle and mortar

and the samples were kept in an air tight plastic container.

Preparation of Extracts

Powdered *Launaea taraxacifolia* (245.51 g) were macerated in 3 L of n-hexane in extraction jar such that the level of the solvent was above that of the plant materials. The macerated mixtures were then left for 72 hours at ambient temperature. The extracts were filtered out from the macerated mixture using Whatman 185 µm filter paper. The n-Hexane extracts were concentrated in a vacuum Rotary Evaporator under reduced pressure and suitable temperature, transferred to appropriately labelled 250 ml beaker and allowed to stand at ambient temperature to permit evaporation of residual solvents. The procedure was repeated using methanol after the residue of the n-hexane extract has been air-dried

Determination of 2, 2′-azino-bis-(3-ethyl) benzothiazoline-6-sulfonic acid (ABTS) radical cation scavenging activity.

$$\% \text{ inhibition} = \frac{(A_{control} - A_{sample}) \times 100}{A_{control}} \quad \ldots\ldots (1)$$

Where; A = absorbance

The absorbance was measured at 234 nm. Indomethacin was used as reference standard and the percent inhibition was also calculated using equation 1 (Shinde *et al.*, 1999).

ANALYSIS OF DATA

GraphPad Prism 3 software (San Diego, USA) was used to determine the IC_{50} through a non-regression analysis. The IC_{50} was taken as the concentration of sample that scavenged 50 % of the radicals. Results are presented as mean ± standard error of the mean.

RESULT AND DISCUSSION

The antioxidant activity (ABTS) and Lipoxygenase inhibitory effect of the methanol extract of the leaves of *L. taraxacifolia* are shown in Table 1 and 3. These were carried out with *in vitro* method at various concentrations (100, 200, 300….500 µg/mL) of the extract. The extract tends to display a significant antioxidant activity at 100 µg/mL concentration, this was noticed with the positive control too. The higher the concentration the less the antioxidant effect that was noticed though there was a climax at 400 µg/mL concentration. The IC_{50} value for both antioxidant and anti-inflammatory activities of the extract can be said to be remarkable and favourably compared (70.59 µg/mL, 30.06 µg/mL) with the positive control with IC_{50} values (62.83 µg/mL, 25.25 µg/mL). The positive control was employed to determine the extent of the significance of the extract used.

The 2,2′-azinobis-3-ethylbenzothiazoline-6-sulfonate, ABTS radical cation decolourisation assay based on the scavenging of $ABTS^{\cdot+}$ radicals by antioxidants component of the extracts was used. The assay follows the procedure of Atolani *et al.*, (2013), with slight modifications (Atolani *et al.*, 2013). All analysis was carried out in duplicate.

Anti-inflammatory Activity of the Extracts

The anti-inflammatory activity of methanol extract of *Launaea taraxacifolia* was studied using the anti-lypoxygenase activity of the plant extracts. The anti-Lipoxygenase activity was studied using linoleic acid as substrate and lipoxidase as enzyme. Test samples were dissolved in 0.25 mL of 2 M borate buffer at pH 9.0 and added 0.25 mL of lipoxidase enzyme solution (20,000 U/mL) then incubated for 5 min at 25 ^{0}C. After which, 1.0 mL of linoleic acid solution (0.6 mM) was added, and thoroughly mixed.

Table 1: ABTS Activity of Methanol Extract of *L. taraxacifolia*

S/N	Samples	Concentration (µg/mL)	% Mean ± SEM
1	Methanol Extract of *L. taraxacifolia*	100	18.45 ± 4.26
2		200	28.79 ± 0.21
3		300	26.48 ± 3.37
4		400	32.93 ± 1.86
5		500	33.26 ± 0.72
	Ascorbic acid (Control)		
6		100	19.65 ± 0.61
7		200	22.61 ± 0.38
8		300	27.12 ± 6.03
9		400	28.34 ± 4.96
10		500	23.55 ± 0.15

Table 2: IC_{50} Antioxidant Activity of Methanol Extract of *L. taraxacifolia*

Test materials	IC_{50} (µg/mL)
Methanol extract of *Launaea taraxacifolia*	70.59
Ascorbic acid	62.83

Koukoui *et al.* (2015) reported the antioxidant activity of ethanol-aqueous *L. taraxacifolia* leaves extracts, this was demonstrated by measuring the production of free radicals by the PLB985 cells in the presence of 100 nM PMA alone or "100 nM" PMA with different concentrations of the extracts of this wild vegetable. The results obtained from Koukoui *et al.* (2015) confirmed that the lower doses of extracts displayed significant antioxidant activity compared to higher doses of the extracts. From "0.5 mg/ml" of extracts, ROS production induced by "100 nM" PMA in cells PLB985 was totally canceled. At lower concentrations, the sustained ROS production by the phagocytes appears to overcome the antioxidant capacity towards the end of the measurement. These results are very interesting and show that *L. taraxacifolia* leaves extracts may have significant antioxidant properties (Koukoui *et al.* 2015).

Borokini and Labunmi, (2017) reported the antioxidant behavior of aqueous, methanol and ethanol extracts of *L. taraxacifolia* were evaluated employing *in vitro* assays to assess the scavenging properties of 2, 2-diphenyl-1-picryl hydrazyl (DPPHRSP), nitric oxide (NORSP) and hydroxyl (OHRSP). Their study affirmed the excellent antioxidant display of this plant though it will be expected the aqueous extract will be more active which indeed was so as the study reveals (Borokini and Labunmi, 2017). This study complements earlier studies of the antioxidant action of *L. taraxacifolia* leaves' extracts.

Borokini and Labunmi, (2017) reported the presence of some flavonoids such as caffeic acid, ellagic acid, quercetin, kaempferol and chlorogenic acids, these compounds are reputed to be natural antioxidants. They may be responsible for this activity though some authors have investigated the antioxidant activity of this wild vegetable, no author has investigated this activity employing ABTS *in-vitro* assay as employed in this study (Borokini and Labunmi, 2017).

Table 3: Lipoxygenase Activity of Methanol Extract of *L. taraxacifolia*

S/N	Samples	Concentration (µg/mL)	% Mean ± SEM
1	Methanol Extract of *L. taraxacifolia*	100	54.15 ± 0.00
2		200	55.36 ± 0.00
3		300	52.61 ± 0.00
4		400	47.02 ± 0.00
5		500	52.02 ± 0.00
	Indomethacin (Control)		
6		100	28.02 ± 0.00
7		200	44.84 ± 0.00
8		300	74.34 ± 0.00
9		400	85.32 ± 0.00
10		500	95.30 ± 0.00

Table 4: IC_{50} for Lipoxygenase Activity of Methanol Extract of *L. taraxacifolia*

Samples	IC_{50} (µg/mL)
Methanol extract of *Launaea taraxacifolia*	30.06
Indomethacin (Control)	25.25

Owoeye *et al.*, (2015) carried out the histological and biochemical studies on leaves of *L. taraxacifolia*. Their studies revealed that *Launaea taraxacifolia* displayed chemoprotective effects against drug induced oxidative stress, neuronal death and alteration of brain microanatomy (Owoeye *et al.*, 2015). Oweoye and Onwuka, (2016) complimented Oweoye *et al.*, (2015)'s

study, they gave structural and chemical evidence that the extracts of this plant ameliorate lead induced neurotoxicity and postulated that these neuroprotective effects are due to its antioxidant activity. Antioxidants protect against oxidative stress induced tissue damage (Owoeye and Onwuka, 2016; Owoeye *et al.*, 2015). This study reports for the first time the anti-inflammatory activity of the methanol extracts of the leaves of *L. taraxacifolia* to the best of our knowledge.

CONCLUSION

In conclusion, our work suggested that the leaves of *L. taraxacifolia* is a potential source of anti-inflammatory agents and thus provides the first pharmacological evidence to support its use in the management of inflammatory conditions in African TM. Further work on the phytochemistry of this vegetable will be encouraged, more pharmacological research should be done to identify its importance and medicinal value of this underutilized vegetable. This plant may be employed to prevent or fight against non-communicable diseases such as cardiovascular diseases, diabetes and cancer. We therefore recommend the domestication of this plant since it can be used as a health food.

Conflicts of Interest

The authors declare no conflict of interest.

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