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Toxicity Effect of *Launaea taraxacifolia* Aqueous Extract on Vital Organs of Albino Rat

Florence Ifechukwude Aboderin[1], Joshua Seun Olajide[2], Adekunle Abiodun Adesiyan[3]

[1]Department of Heamatology and Immunology, Obafemi Awolowo University, Ile-Ife, Nigeria

[2]Centre for Distance Learning, Obafemi Awolowo University, Ile-Ife, Nigeria

[3]Department of Chemical Pathology, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

Email address:

udoifechukwude@yahoo.com (F. I. Aboderin), jsolajide@yahoo.com (J. S. Olajide), kunzlesiyan@gmail.com (A. A. Adesiyan)

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Abstract: *Launaea taraxacifolia* (*Efo yanrin*) aqueous extract was orally administered to albino rats with view to investigating the haematological, biochemical and histological difference on body organs. Fifteen (15) albino rats divided into five groups each of three rats were used. Group I was the control while groups II III, IV, and V were dosed with 500mg/kg, 1000mg/kg, 2000mg/kg and 3000mg/kg respectively. Rats treated with different doses of aqueous extracts had increase packed cell volume with a significant increase of 43% in groups II and V alongside with Haemoglobin of 14.3mg/dl increase compared with the control. Moreover, the differential leucocyte counts revealed moderate increase in the lymphocytes count of groups II and V when compared with normal value. The aqueous extract of *L. taraxacifolia* is safe and has immunostimulatory effect. However, the effect of the extract on the liver of rats has varying degrees of lesions ranging from mild to severe diffuse degeneration of hepatocytes with periportal cellular infiltration. There was presence of multiple foci of caseous necrosis of the hepatic cells. Animals to which aqueous extract was administered at graded doses showed presence of eosinophilic cast in degenerated tubules with cellular infiltration in the renal interstitium. The histological result showed that the aqueous extract of *L. taraxacifolia*, could be toxic to the liver and kidney and caution should therefore be exercised in its use for medicinal purpose.

Keywords: Toxicity, *Launaea taraxacifolia,* Extract, Herbal, Rat

1. Introduction

Locally prepared plants' extracts have always been used by human without any certainty of its composition, optimal dosage and adverse effect on human health. Studies have shown that between 70% and 95% of individuals in most developing countries use traditional medicine, including herbal medicines, for the management of diseases and to address their primary health-care needs [1]. In some developed nations, the use of traditional medication is equally significant. In Canada, France, Germany and Italy for instance, it was reported that between 70% and 90% of the people use traditional medicines with the assumption of it as complementary, alternative, or nonconventional medications [2]. Howbeit, *Launaea taraxacifolia,* wild lettuce, is an annual West Tropical Africa herb and has a cosmopolitan distribution. The plant is found in the Tropical West Africa, Mexico, West Indies, Central and South America, Europe, North Africa, Atlantic Islands, South, West and Central Asia [3]. It grows in an open habitat and is considered as weed because it invades fields and farmlands.

There are several traditional uses of the plant. The plant is used for food, medicine, social and economic purposes. The leaves are eaten fresh as a salad or used in soups and sauces preparation. Several studies have revealed that the plants are nutritionally important due to its high levels of vitamins, minerals, proteins, essential fatty acids and fibre contents [4]. The leaves of *L. taraxacifolia* have been reported to have hypolipidaemic effect and the ability to treat water retention disorders [4] [5]. *L. taraxacifolia* leaf has various traditional uses among Ghanaians and many ethnic groups in Nigeria

[6]. The seed oil is supposedly used for 'hardening of the arteries' (atherosclerosis) and as a substitute for wheat germ oil while other people apply wild lettuce latex directly to the skin to kill germs. Some people inhale wild lettuce for a recreational 'high' or hallucinogenic effect. It is therefore of necessity to investigate the potential damaging effect this plant pose to vital bodily organs and haematological properties.

2. Method

2.1. Aqueous Extract

Fresh plant leaves were collected from the Obafemi Awolowo University farm in Ile-Ife and was identified at Department of Botany, Obafemi Awolowo University. The fresh plant material was then washed under running tap water, air dried, ground into a fine powder and stored in air-tight containers at 4°C. A 100 g of pulverized air dried leaves of *L. taraxacifolia* each, was mixed with 500 ml of 70% aqueous in a conical flask, plugged with cotton and then kept on a shaker for 72 h. The mixture was then filtered and the solvent was evaporated using rotary vacuum pump and the crude extract obtained was stored in an air-tight desiccator.

2.2. Grouping of Animals

The animals were housed in polypropylene cages (55 x 32.7 x 19 cm) in a temperature (23 ± 2°C) and lightning (12 h of light and 12 h of darkness) controlled environment. Albino rats weighing between 55-130g were randomly divided into five groups labeled as Groups I (control), II, III, IV and V each consist three rats. Water was only administered to group I. 1ml of 500 mg/kg, 1ml of 1000 mg/kg, 1ml of 2000 mg/kg, and 1ml of 3000 mg/kg of aqueous extract of *L. taraxacifolia* was administer to group II, III, IV, and V respectively. The administration dose volume was 1ml/kg body weight of the animal. After the administration of test substance, animal feed was withheld for 2 hrs. The rats were later fed with normal feed for 7 days. Animals were observed individually after at least once during the first 30 min, and periodically during the first 24 hours, with special attention given during the first 4 hours and daily thereafter for a total of 7 days. All the animals were observed at least twice daily with the purpose of recording any symptoms of ill-health or behavioural changes.

2.3. Tissue Processing

Rats were sacrificed while the liver and the kidney were excised, and directly fixed in 10% formal saline prior to processing. It was later washed thoroughly in normal saline, trimmed, processed, embedded in paraffin and sectioned at a thickness of 4-5 μm. Staining of the cells was done according to Mayer's Acid-Alum-Haematoxylin and eosin. Haematological investigations such as packed cell volume, haemoglobin [6] and white blood count were carried out based on standard procedures [7].

2.4. Statistical Analysis

Results were presented as mean and standard error (Mean ± S.E). The statistical significance between the control and each of the treated groups were determined by Dunnet's *t*-test after one-way ANOVA using SPSS. The level of significance was set at $P < 0.05$.

3. Result

The results obtained for phytochemical screening of the aqueous extract of the leaf of *L. taraxacifolia* showed the presence of flavonoids, saponins, terpenoids, steroids, cardiac glycosides and tannins with the absence of alkaloid and anthraquinones. The result obtained for proximate analysis of aqueous extract of the leaf of *L. taraxacifolia,* expressed as per cent mean ± SEM, showed high calorific value (280.70 ± 0.80) Kcal/100g, total carbohydrate (18.2 ± 1.33), crude protein (17.4 ± 1.20), crude fibre (16 ± 0.05), and total ash (21.50 ± 0.07) while crude fat (4.70 ± 0.03) was the lowest.

During the acute toxicity studies, the LD50 was above 3000 mg/kg in the treated rats. Identified behavioural changes among the animals included aggressiveness, vomiting, excitement, salivation, diarrhoea, eating, drinking, sedation and death. These were observed in the treated groups as compared to the control group. Doses 500-3000 mg/kg body weight of the aqueous extract administered did not result in lethality over the 24 hour period. No latent toxicity was observed in the animals after keeping them for extra 7 days (Table 1)

Table 1. *Effect of Extracts on Behavioural Responses in Rat on Acute Oral Toxicity in the First 24 Hours*

S/N	Response	Group Observation				
		I (0mg/kg)	II (500mg/kg)	III (1000mg/kg)	IV (2000mg/kg)	V (3000mg/kg)
1.	Alertness	Yes	Yes	Yes	No	No
2.	Grooming	Normal	Normal	Normal	Normal	Normal
3.	Touch response	Yes	No	No	No	No
4.	Torch response	Yes	Yes	Yes	Yes	Yes
5.	Tremor	No	No	No	No	No
6.	Convulsion	No	No	No	No	No
7.	Gripping strength	Normal	Reduced	Reduced	Reduced	Reduced
8.	Response to food	Yes	No	No	No	No
9.	Pupils	Normal	Normal	Normal	Normal	Normal
10.	Urination	Normal	Normal	Normal	Normal	Normal
11.	Salivation	No	No	No	No	No

S/N	Response	Group Observation				
		I (0mg/kg)	II (500mg/kg)	III (1000mg/kg)	IV (2000mg/kg)	V (3000mg/kg)
12.	Hyperactivity	Normal	Reduced	Reduced	Reduced	Reduced
13.	Skin colour	Normal	Normal	Normal	Normal	Normal
14.	Corneal reflux	Normal	Normal	Normal	Normal	Normal
15.	Pinna reflux	Normal	Normal	Normal	Normal	Normal
16.	Sound response	Normal	Normal	Normal	Normal	Normal

There was a marked difference in the body, liver and kidney weights after administration of aqueous extracts of *L. taraxacifolia* across the treated and untreated groups just as haematological parameters and histopathological changes. There was considerable increase in the body weight of animals administered with the extract compared with the control group. Group IV animals administered with 2000mg/Kg showed the most pronounced body weight gain. There was considerable loss in body weights in group I as compared to other groups. The difference in kidney weight among group II to V was found significant with weight gain. Group III showed highest increased body weight after the administration of the extract meanwhile, group IV showed highest mean weight gain in liver and kidney. PCV remained highest and constant in group II and V. Platelets was highest in group I and least in group III. Neutrophil and lymphocytes were found to be lowest and highest among rats of group V, though group I had the mean percentage of lymphocyte next to group V (Table 2).

Table 2. *Haematological Parameters after the Administration of Extracts*

Group	Conc. of Plant Extract (mg/kg)	PCV (%)	Hb(g/dl)	Wbc (/mm^3)	Platelets (/mm^3)	Neutrophil (%)	Lymphocyte (%)
I	0	38.00±1.00	12.80±0.10	6,800±100.00	870,000±3,214.55	39.00±2.08	62.67±2.00
II	500	43.00±1.00	14.30±0.10	9,100±100.00	628,666±3,214	41.67 ±2.08	61.00±2.00
	t-, p-value	-6.124, 0.004	-18.371, 0.000	-35.631, 0.000	70.321, 0.000	-2.000, 0.143	1.600, 0.185
III	1000	24.67 ±0.58	8.33 ±0.15	6,850±50.00	551,666±18,929	43.00±2.00	59.00±1.00
	t-, p-value	20.000, 0.000	42.375, 0.000	-1.225, 0.288	28.161, 0.001	-3.098, 0.055	-2.750, 0.074
IV	2000	38.00±1.00	12.70 ±0.10	8,083.33±76.38	681,666.67±7,637.63	47.67 ±2.52	50.33 ±1.53
	t-, p-value	0.000, 1.000	1.225, 0.288	-24.350, 0.000	35.734, 0.000	-5.543, 0.016	8.273, 0.002
V	3000	43.00±1.00	14.30 ±0.10	3,783.33±28.87	553,333.33±5,773.50	35.33 ±4.73	62.67 ±2.52
	t-.p-value	-6.124, 0.004	-18.371, 0.000	90.500, 0.000	71.813, 0.000	1.315, 0.310	0.000, 1.000

The results are the mean of 3 determinants ± S.D, *P-value significant at 0.05.

Histology of the liver confirmed no cellular damage in all the treated groups, compared to the control group. Indices assessed included reactive changes, apoptosis, necrosis, inflammation and steatosis. The effect of aqueous extract at graded doses showed presence of eosinophilic cast, degenerated tubule with cellular infiltration in the renal interstitium. Meanwhile, total protein and albumin were found to have significantly increased among the group IV animals (Table 3)

Table 3. *Biochemical Parameters of Rat Treated with Extract During Acute Toxicity Study.*

Group	Conc. of Plant Extract (mg/kg)	Total Protein (g/dl)	Albumin (g/dl)
I	0	6.60 ± 0.10	2.93 ± 0.06
II	500	6.70 ± 0.10	2.73 ± 0.06
	t-, p-value	-1.225, 0.288	4.43, 0.013
III	1000	6.77 ± 0.06	3.10 ± 0.10
	t-, p-value	-2.500, 0.082	-2.500, 0.082
IV	2000	6.60 ± 0.10	2.67 ± 0.15
	t-, p-value	0.000, 1.000	2.828, 0.080
V	3000	6.73 ± 0.21	3.20 ± 0.10
	t-, p-value	-1.000, 0.394	-4.000, 0.025

4. Discussion

There have been growing interests in the analysis of plant products for their potential health benefits [9]. This has stimulated intense research as there is an alarming concern as to the toxic effect of 'herbal remedies'. Some of these products contain substantial amounts of chemotherapeutic active ingredients whose adverse effects are mostly unknown [10]. Severe liver injury, including acute and chronic abnormalities and even cirrhotic transformation, leading to liver failure have been described after the ingestion of a wide range of herbal products such as germander (*Teucriumchan aedrysl*, chaparral (*Lerrea tridentate*), mushrooms [11]. It was in lieu of this that the haematological, biochemical and histopathological alterations associated with acute oral administration of aqueous extract of *L. taraxacifolia* was conducted to assess its safety.

L. taraxacifolia has been an important food constituent for both humans and animals in various cultures. As observed from this study, there was no record of death of animal on acute administration of the aqueous extracts of *L. taraxacifolia* at all tested stages and dosage. Obviously, this indicate safety in the acute toxicity stage, although, there were slight observation on their hyperactivity, gripping strength and alertness which was found to agree to the index for the acute toxicity of LD50 [12] and as such coherent with the assertion that substance that show LD50 at 1000mg/Kg body weight should be considered safe as of low toxicity [13]. The presence of flavonoids in the aqueous phytochemical screening of *L. taraxacifolia* has also been

reported in ethanol-aqueous extracts [14]. The fact that such extracts as alkaloids and anthraquinones were absent in the leaf aqueous extracts is also consistent.

The rats in group II and V showed better haematological status and performance in terms of weight gain. The PCV and Hb therewith were found to increase in value compared to other groups. This is an indication that there was no anaemic condition since reduction would have been a sign of anaemia [15]. Higher WBC (leucocytes) count was noticed in the control group compared to others. The differential leucocyte count showed considerable increase in neutrophil in first few hours, however, there was no significant difference in basophil, monocytes counts in the entire treatment group. The lymphocyte counts of rats dosed with *L. taraxicofolia* was higher and significantly different ($p<0.05$) in group II and IV when compared with the control group. The primary role of lymphocytes is in humoral antibody formation and cellular immunity [16]. In essence, the increased lymphocyte counts in rats of group I and V show sign of immunostimulatory effect of *L. taraxicofolia*. The kidney of the rats in the control group showed no visible lesion. Significant increase the biochemical parameters especially total protein was coherent with administration of ethanoic extract of *L. taraxicofolia* Sprague-Dawley rats [17].

5. Conclusion

Histological result has from this study showed that aqueous extract of *Launaea taraxacifolia* of higher dosage may be toxic to the liver and kidney and caution should therefore be exercised in its use for medicinal purpose. *Launaea taraxacifolia* extract has no adverse effect on blood and its cellular constituents. Considering the toxicity effects of the plant aqueous extract on organ architecture, lower dosage was not injurious to the organs under study. Pharmaceutical dosage should be sought for in relation to the beneficial effect of the plants on man as *L. taraxacifolia* is a very important herbal remedy and feed for both humans and animals.

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