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## Toxicity Studies on the Methanolic Extract of *Portulaca oleracea* L. (Fam. Portulacaceae)

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**Abstract:** Toxicity studies on the methanolic extract of *Portulaca oleracea* L. were carried out on mice intraperitoneally. The LD<sub>50</sub> was calculated using the methods of Miller and Tainter (LD<sub>50</sub>, 1853.5 mg kg<sup>-1</sup>), Reed and Muench (LD<sub>50</sub>, 1871 mg kg<sup>-1</sup>) and Karber method (LD<sub>50</sub>, 1875 mg kg<sup>-1</sup>) these values placed the plant to be moderately toxic. Histopathological findings revealed that the extract has effect on the kidney, lung and liver in a dose dependent manner.

**Key words:** *Portulaca oleracea*, acute toxicity, LD<sub>50</sub>, histopathology

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### INTRODUCTION

*Portulaca oleracea* L. (commonly called purslane) is an herbaceous weed widely distributed throughout the World. It is known by indigenous tribes of Nigeria as *Fasa kasa*, in Hausa, *Papasan* in Yoruba and *Efere makara* in Efik (Burkill, 1997).

The plant has been used as vegetable and for medicinal purpose for hundreds of years. The ancient Egyptians use it for heart failures and heart disease. In Africa purslane has been used as antibacterial, anti-diabetic, antihelmintic, antiscorbutic, diuretic and as pain reliever in haemorrhoid and whitlow. The seeds are demulcent, carminative, diuretic and slightly astringent (Burkill, 1997; Boulus *et al.*, 1984; Iwu, 1993). Externally, the plant has been used to treat burns, earache, insect stings and inflammations and skin diseases (Leung and Forster, 1996).

*P. oleracea* has been shown to exhibit antibacterial, antifungal, anti-inflammatory, diuretic (4), anti-convulsant and analgesic activity (Chan *et al.*, 2000). Gholamreza *et al.* (2004) also showed the administration of the aqueous and ethanolic extracts of purslane has some beneficial preventive effect on gastric ulcers induced by HCl or ethanol and reduce the gastric acidity in pylorus-ligated mice

Chemically, *P. oleracea* contain many biologically active compounds, some of them being nutritive. Some of the biologically active (and in some case, potentially toxic

compounds) include free oxalic acids, alkaloids, omega-3 fatty acids, coumarins, tannins, flavonoids, cardiac glycosides and anthraquinone glycosides. It has high contents of Omega-3 fatty acids and protein compared to other vegetables (Ezekwe, 1999) monoterpene-*portuloside A*-was also isolated from the plant-*P. oleracea* and is said to be rich in vitamins (Sakai, 1996) essential minerals (WHO, 1990; Keys, 1976) and fatty acids such as omega-3 acids (Bown, 1995).

Despite these numerous uses and the various chemical constituents reported in *P. oleracea*, no data on the toxicity of the plant could be found in the available literature, although the plant is reported to contain cardiac glycosides and oxalic acids, which can be toxic. This work is therefore aimed at establishing the safety or otherwise of *P. oleracea* with regard to its numerous uses in traditional medicine, as vegetable to human and as animal feed.

### MATERIALS AND METHODS

**Plant material:** The plant *Portulaca oleracea* was collected around Samaru Village near Ahmadu Bello University, Zaria, Nigeria in October 2004 and identified by the herbarium unit of the Department of Biological Sciences, Ahmadu Bello University and Zaria, Nigeria. A voucher specimen (No. 2389) has been deposited in the same place.

**Preparation and extraction of the plant material:** The plant material was dried in shade and grounded to a coarse powder. Fifty grams of the powdered material macerated with 250 mL methanol at room temperature for 24 h. The extract was filtered and dried at 40°C under vacuum. The yield was 14.5% (w/w).

**Animals used:** Swiss albino mice (17-24 g) of either sex maintained at the animal house of the Department Pharmacology and Clinical Pharmacy, Ahmadu Bello University, Zaria were used for the determination of the LD<sub>50</sub>. The animals were housed in well-ventilated room at temperature 24±2°C; fed with standard feeds and water *ad libitum*. The protocol for the study was approved by Ahmadu Bello University Ethics Committee (ABUEC) responsible for the implementation of ethics in animal experimentation.

**Acute toxicity:** Different doses of the extract were injected intraperitoneally into six groups of four mice each. The number of death was counted at 24 h after treatment. The LD<sub>50</sub> values were determined by the methods of Karber; Miller and Tainter and Muench and Reed as modified by Aliu and Nwude (1982).

**Histopathology:** Tissue section of the liver, kidney, lungs and heart were fixed in 10% buffered formalin for 72 h. The tissues were processed using technicon and sectioned at 5 µm, they were mounted on clean glass slides, dried at room temperature and stained with Haematoxylin and

Eosin. This was cover slipped and dried. The slides were studied using Zeiss microscope (Arthur and John, 1978).

**RESULTS AND DISCUSSION**

The sign and symptoms observed before the death of the animals include micturation, muscle weakness, dyspnoea, sedation and diarrhea, which were all observed to be dose dependent. The increased micturation resulting from increased diuresis observed can be attributed to the presence of the flavonoids and the diarrhoea might be due to the anthraquinones and its derivatives (Leung and Forster, 1996; Ezekwe *et al.*, 1999).

The acute toxicity established the intraperitoneal LD<sub>50</sub> of the extract to be 1853.5 mg kg<sup>-1</sup> by the Miller and Tainter method (Table 1). Probit values of the corrected percentage values are plotted against the logarithms of the dose and the curve is presented in Fig. 1. The LD<sub>50</sub> is calculated from slope of the linear equation. Reed and Muench method establish an LD<sub>50</sub> of 1871 mg kg<sup>-1</sup>, (Table 2) and 1875 mg kg<sup>-1</sup> was obtained using the Karber method (Table 3). This shows that the methanolic extract of *P. oleracea* is moderately toxic based on the WHO toxicity rating (Gleason *et al.*, 1969) the plant is expected therefore, to have a high therapeutic index.

On the histopathological studies (Table 4), the plant extract was found to cause congestion of blood vessels and necrosis of renal tubular epithelium and the lungs. Congestion and necrosis of hepatocytes especially around the central vein were observed in the liver. The

Table 1: Results for LD<sub>50</sub> of methanolic extract of *P. oleracea* according to miller and Tainter method

Group	Dose (mg kg <sup>-1</sup> )	Dead	Survivors	Dead (%)	Corrected (%)	Probit
6	2250	4	0	100	93.75	6.47
5	2000	3	1	75	75.00	5.67
4	1750	1	3	25	25.00	4.33
3	1500	0	4	0	6.25	3.44
2	1250	0	4	0	-	
1	1000	0	4	0	-	

Table 2: Results for LD<sub>50</sub> of methanolic extract of *P. oleracea* according to reed and Muench method

Group	Dose (mg kg <sup>-1</sup> )	Dead	Survivors	Dead	Cumulative survived	Total	Survival (%)
6	2250	4	0	4	8	12	-
5	2000	3	1	7	8	15	53.3
4	1750	1	3	8	7	15	46.7
3	1500	0	4	8	4	12	-
2	1250	0	4	8	-		
1	1000	0	4	8	-		

Table 3: Results for LD<sub>50</sub> of methanolic extract of *P. oleracea* according to Karber method

Group	Dose (mg kg <sup>-1</sup> )	Dose difference	Dead	Mean	Product
6	2250		4	-	-
5	2000	250	3	3.5	875
4	1750	250	1	2.0	500
3	1500	250	0	0.5	125
2	1250	250	0	-	-
1	1000	250	0	-	-

Table 4: Results of histopathological observation on some organs of the dead mice

Dose of extract (mg kg <sup>-1</sup> )	Observed effect on the organ				
	Lungs	Kidney	Liver	Heart	Spleen
1700	Congested lungs	Necrosis of glomerulus and renal tubular epithelial cells	Congested blood vessels. focal areas of necrosis hepatocytes.	No significant histopathological findings	No significant histopathological findings
2000	Congested lungs	Congested blood vessels, various areas of necrosis of epithelium of renal tubules, Necrosis of glomerulus.	Congested blood vessels congested sinusoidal capillaries. Focal areas of necrosis hepatocytes	No significant histopathological findings	No significant histopathological findings
2250	Congested lungs	Congested blood vessels, widened bowmans'space.	Congested sinusoidal capillaries (severe), focal patchy areas of necrosis hepatocytes	No significant histopathological findings	No significant histopathological findings

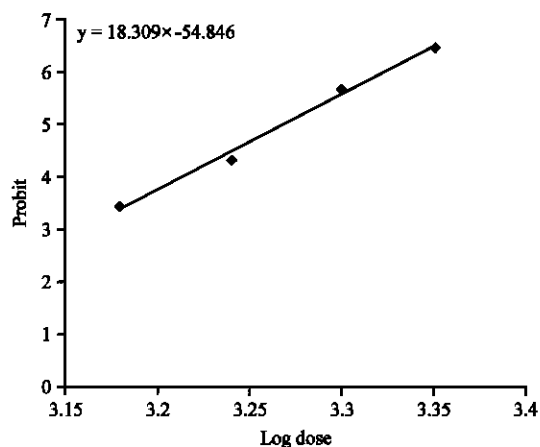


Fig. 1: Log dose-Probit curve according to Miller and Tainted method for the determination of LD<sub>50</sub> of *P. oleracea*

heart and spleen sections showed no significant histopathological changes.

### CONCLUSION

*Portulaca oleracea* is moderately toxic based on the LD<sub>50</sub>-values obtained by applying the three methods, according to WHO classification. A further chronic toxicity study is recommended to further ascertain the safety or otherwise of the plant.

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