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Research article

TOXICOLOGICAL STUDIES OF LEAF EXTRACT OF *Dodonaea viscosa* IN ALBINO RATS

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ABSTRACT

This work was undertaken to investigate the toxicological effect of oral administration of aqueous leaf extract of *Dodonaea viscosa*, in albino rats. For sub-acute toxicity test, the effects of the extract on the activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP) and levels of total protein (TP), Unconjugated bilirubin (U.BIL), albumin (ALB) and globulin (GLO) was assayed. Oral administration of the leaf extract produced significant ($p<0.05$) changes in mean serum activities of AST and ALT and levels of U.BIL and GLO in rats administered the extract (0.5g/kg) body weight compared to the control group. No death was recorded in acute toxicity test. Phytochemical analysis revealed the presence of alkaloids, terpenoids, flavonoids and saponins in aqueous leaf extract of *Dodonaea viscosa*. At the doses administered, aqueous leaf extract of *Dodonaea viscosa* does not appear to be toxic. **Copyright © WJMMS, all rights reserved.**

KEY WORDS: *Dodonaea viscosa*, liver enzymes total protein albumin, globulin.

INTRODUCTION

Dodonaea viscosa locally known as (Jos Pribet or fil-fil) is an evergreen woody prennial shrub belonging to the family *Sapindaceae*. It is a diecious or monoecious multi stemmed shrub or single stemmed tree up to (7 – 9) m tall, bark is blackish and of variable roughness, thin and exfoliating in long time strips[1]The plant has many medicinal properties and has been used by native communities from all regions where it is found. The leaves were reported to be used as mouth wash to treat toothache [2] and relieving itching.

Herbal medicine sometimes referred to as botanical medicine involves the use of plant, or parts of plant to treat injuries or illness. The world health organization (WHO) estimated that 80% of the world population presently use herbal medicine for some aspect of primary health care [3].

The leaves and bark of *Dodonaea viscosa* are being used locally as a drug by individuals in treatment of fevers, headaches, toothache e.t.c in various parts of Nigeria. In Kano State the plant is most commonly used to treat typhoid fever, this led to an interest in the research to find out if this particular plant has any toxic effect. Therefore, this work was carried out to determine the toxicological effect of aqueous leaf extract of *Dodonaea viscosa* on the liver of rats administered with the extract.

MATERIAL AND METHODS

Sample Collection

Fresh leaves of *Dodonaea viscosa* were obtained from the tree of the plant at a garden along Dr. Bala Muhammad way, Nassarawa GRA Kano. They were dried indoors at room temperature and grounded into powdered form.

Plant Sample Preparation

The plant extract was prepared by weighing (50g) of the leaf powder and dissolved in distilled water (150ml). The solution was allowed to stand for 72 hours after which it was filtered. The residue was dried completely and weighed again. The amount of the extracts in the filtrate was determined and the extracts were administered to the rats orally according to body weight.

Experimental Design

The weight of the albino rats were taken before the start of the experiment using a weighing balance (scout TM pro 400g). They were found to weigh an average of 80g. The experimental rats (25) were divided into two parts, for acute toxicity and sub acute toxicity testing.

Sub acute Toxicity Testing

Sixteen (16) of the rats were divided into four groups of four rats each. Groups 1, 2, 3 and 4 were fed with Growers feed and water. The aqueous leaf extract was orally administered using an insulin syringe, in the concentration of 0.5g, 0.75g and 1.0g per kilogram body weight for groups 1,2,and 3 respectively, while group 4 served as the control and were fed with only commercial feed and water during the period of twenty one (21) days.

Acute Toxicity Testing

The second set of rats numbered 9, were used for acute toxicity testing to determine the lethal dose. They were divided into three groups with three rats in each group. They were administered with 1500mg, 2500mg and 3500mg per kilogram body weight of the leaf extract respectively for 24 hours. The number of death in animals administered with the leaf extract were noted.

Blood Sample Collection and Preparation

At the end of twenty one days study period, all the animals in the sub acute toxicity study were weighed again before they were sacrificed, their blood was collected in test tubes immediately they were sacrificed and centrifuged using Harrier 15/80 MSE Centrifuge at 3000 revolution per minute for 5 minutes, after which 2ml of the serum, was collected and stored in small bottles.

Sample Analysis

Serum separated from the blood was used for the determination of the activities of the following liver enzymes; AST and ALT [4], ALP [5] and the levels of TP [6], albumin [7], UBIL and GLO [8].

Phytochemical screening

Phytochemical screening of the leaf extracts was carried out using the methods of [9] and [10]to detect the presence of some phytochemicals such as alkaloids, flavonoids, anthraquinones, tannins, saponins and terpenes.

Statistical analysis

Student's 't' test was used for statistical analysis ($p < 0.05$)

RESULTS

From table 1, it can be seen that there was a significant difference ($p<0.05$) in the activities of ALT and ALP in group of rats receiving 0.5g/kg when compared with group 4 control rats. Group 2 rats administered 0.75g/kg of the leaf extract had significantly higher ($p<0.05$) mean ALT values compared with that of group 4 control rats. The mean serum ALP activity in group 3 experimental rats showed a significant difference ($p<0.05$) when compared with the group 4 control rats.

Table 1: Effect of oral administration of leaves extract of *Dodonaea viscosa* on AST, ALT and ALP activities in rats

Group	Dose g/kg	AST (U/L)	ALT (U/L)	ALP (U/L)
1	0.50	172.00	78.65[a]	154.00[b]
n=4		±	±	±
		14.80	13.08	12.90

2	0.75	185.00	67.00[c]	167.00
n=4		±	±	±
		13.90	13.09	11.50
3	1.00	174.00	70.60	163.60[d]
n=4		±	±	±
		12.18	3.89	15.80
4	__	161.50	63.5	155.00
n=4		±	±	±
(control)		6.36	7.70	14.14

Result are presented as mean ± S.D

a, b, c, and d are significantly different from control at p (<0.05)

Table 2 presents the mean serum levels U.Bil, T. PRO, ALB and GLO in rats administered with leaf extract of *Dodonaea viscosa* when compared to that of group 4 control rats.

Table 2: Effect of oral administration of leaf extract of *Dodonaea viscosa* on U.Bil, T.PRO, ALT and GLO levels in rats.

Groups	**Dose in g/kg**	**U.BIL**	**T.PRO(g/L)**	**ALB(g/L)**	**GLO(g/L)**
1	0.5	1.30[a]	71.00	40.00	31.00[c]
n=4		±	±	±	±
		2.68	3.08	2.12	3.50
2	0.75	1.67	69.60	40.00	29.60
n=4		±	±	±	±
		0.58	1.78	1.80	2.16
3	1.0	2.00[b]	73.60	40.30	33.30
n=4		±	±	±	±
		0.47	1.47	0.10	1.70
4	__	1.50	67.00	37.5	29.5
n=4		±	±	±	±
(control)		0.71	4.12	0.70	4.90

Results are presented as mean ± S.D

a, b, and c: significantly different from control at (p <0.05)

The mean serum levels of U.BIL and GLO showed significant difference (p <0.05) in group 1 rats administered with 0.5 g/kg of the leaf extract when compared with the values of control rats in group 4. Group 3 rats administered with 1.00 g/kg of the leaf extract showed mean serum levels of U.BIL to be significantly

different ($p < 0.05$) when compared to the group 4 control rats. Total protein and albumin were found to have no significant difference.

Determination of LD_{50}

Table 3: Lethal Dose (LD 50) determination result of leaves extracts of *Dodonaea viscosa* administered to rats.

Group	Dose (mg/kg)	No. of death
1 n=3	1500	0
2 n=3	2500	0
n=3	3500	0

After the administration of the doses within 24 hours, none of the experimental rats receiving the leaf extract died.

Table 4: Phytochemical screening of leaf extract of *Dodonaea viscosa*

Phytochemical	Leaf
Anthraquinones	-
Alkaloids	+
Flavonoids	+
Tannins	+
Saponins	+
Terpenoids	+

Key:

+ = present

- = Absent

DISCUSSION

Generally, changes in the activities of AST, ALT and ALP in the serum indicates insult to the liver since they are tissue specific and are only present in small amount due to turn over of cell content after cell death, hence that is why their increase determines damage to the liver cells.

The claim in this locality that the aqueous leaf extract of *Dodonaea viscosa* has medicinal effect against some diseases may be due to the presence of alkaloids, tannins, saponins, terpenoids and flavonoids that were detected in the leaves of the plant (table 4). The assay of the activities of serum ALT, AST, ALP and levels of T. PRO, U.BIL, ALB, GLO as indices for liver damage showed no apparent toxicity. Thus, suggesting that the use of leaf extract of *Dodonaea viscosa* at the doses used in this study may be safe in the treatment of some diseases. For

further work, it is suggested that the dosage and duration of administration of the aqueous leaf extract of *Dodonaea viscosa* in rats be increased. The effect of long term administration of the aqueous leaf extract on other organs like kidney and heart can also be investigated.

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