

**EVALUATION OF TOXIC EFFECTS OF DATURA LEAVES
(*DATURA STRAMONIUM*) IN RAT**

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ABSTRACT

The present study was undertaken to evaluate the toxic effects of leaves of *Datura stramonium* in rats during the period of March to April 2012. Twenty rats were randomly divided in to four equal groups (n=4) and marked as T₀, T₁, T₂, and T₃. Rats of group T₀ were given normal feed and water and kept as control group. Rats of group T₁, T₂, and T₃ were fed with recommended feed and drink water treated with paste of whole leaves of datura @ 50,100 & 200mg/kg body weight respectively. Body weight and hemato bio-chemical parameters were recorded at every 14 days intervals. Rats of group T₃ were apparently normal up to first week. From second weeks of treatment feed consumptions was reduced showing indigestion, anxiety, fatigue, muscular tremor, ataxia, loss of muscle coordination and ruffled hair coat. Rats of group T₁ and rats of group T₂ showed mild toxic symptoms. The mean body weight of rats of group T₃ was significantly (P<0.01) reduced. In group T₃ total erythrocyte count and hemoglobin content were significantly (P<0.01) reduced on day 14 and 28 but in other groups not reduced significantly (P<0.05). The activities of SGPT, SGOT and ALP were elevated in all treated groups than control groups but in group T₃, the elevation of SGPT, SGOT and ALP were significantly higher than that of group T₁ and T₂. The toxic effect of *Datura stramonium* in rats is dependent on duration of treatment and dose.

Keywords: DATURA, RATS, WEIGHT, TEC, SGOT

1. INTRODUCTION

The solanaceae plant *Datura stramonium* is an annual weed of gardens, roadsides and other waste or cultivated land. This is also called Thorn apple, Mad apple, stink weed and Devil's Trumpet (Steenkamp *et al.*, 2004). *Datura stramonium* is a herb of asian origin and is widely naturalized in warmer countries throughout the world and is quite common in the British Isles, often appearing in waste and cultivated ground. All parts of the plant are toxic but the highest amount of the alkaloids is contained in ripe seeds (Miraldi *et al.*, 2001; Friedman and Levin, 1989). The main toxic alkaloids in *Datura stromonium* are the tropane alkaloids, atropine (di-hyoscyamine) and scopolamine (I-hyoscyne) (Friedman and Steenkemp *et al.*, 2004). Atropine and Scopolamine are competitive antagonists of muscarinic cholinergic receptors and are central nervous system depressents (Halpern, 2004). Many cases of accidental poisoning by *Datura stramonium* species have been reported when these plants were eaten accidentally or decoction prepared from herbal prescription (A-Shaikh and Sablay, 2005; Hirschmann *et al.*, 1990). Fatal poisoning with *Datura stramonium* for its mind altering properties and eating and chewing of *Datura* in a suicide attempts (Klein-Schwartz and Odera, 1984; Kurzbaum *et al.*, 2001, Steenkemp *et al.*, 2004). The primary psychoactive substances in *Datura stramonium* are atropine and scopolamine (Giral and Hildalgo, 1983). Scopolamine is available by prescription primarily for treating motion sickness (Darias *et al.*, 1986, Abebe, 1986). The anti-inflammatory property of all parts of the plant accounts for its other medicinal uses (Spring, 1989). The dried leaves of the plants are used as an anti-asthmatic agent (John, 1984; Sezik *et al.*, 1992; De Foe and Senatore, 1993). Mixture of the leaves and seeds taken orally as a decoction or smoke is also used as a cure for the asthma (Hirschman *et al.*, 1990). Aqueous extract of the seeds are reported to be used in the treatment of gastric pains and indigestion (Bhattarai, 1993). Other reported use of the plants are for the stimulation of Central Nervous System (CNS) (Guharov and Barajas, 1991), respiratory decongestion (Zagari, 1992), treatment of dental and skin infections (John, 1984; Daris *et al.*, 1986) and also in the treatment of toothache (Abebe, 1986) and alopecia (John, 1984). The possible Hepato/Nephrotoxicity of the aqueous extract of the seeds (Gidado *et al.*, 2001) of the plant has been reported. So, considering the above context the objectives were to evaluate the toxic effects of *Datura* leaves related to clinical signs and body weight, hemato-biochemical parameters in Rat.

2. MATERIALS AND METHODS

Study period and area:

This study was carried out during March to April, 2012 in the laboratory of Physiology and Pharmacology, Faculty of Veterinary and animal science, Sylhet Agricultural University, Sylhet along with International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR'B), Mohakhali, Dhaka.

Selection of animals:

Twenty healthy adult Long Evans Rats were collected. The average body weights of these animals were 200gm and their average ages were 60 days.

Selection of Plants:

The fresh green leaves were collected from the *Datura stramonium* plants and collected leaves were processed by many rounds of grinding with mortar and pestle to prepare paste of whole leaves for experimentally feeding to the selected rats.

Experimental trial:

The experimental trial was conducted for 28 days. Before treatment rats were randomly grouped into four equal groups (n=4), denoted as T₀ (control), T₁, T₂ and T₃ (the paste of whole leaves of *Datura* extract treated) groups. Group T₀ were fed with recommended feed and drinking water ad. Lib. The target groups (T₁, T₂, T₃) were fed with recommended feed and drinking water treated with the paste of whole leaves of *datura* @ 50 mg/kg, 100mg/kg and 200 mg/kg body weight respectively.

Body weight of the Rats:

The body weight of each of the rats was measured with the help of electric balance prior to feeding in the morning at day 0, day 14 and day 28 and expressed in gram.

Blood collection from the Rats:

For the hemato-biochemical examination, 1.5ml blood samples were collected aseptically from the tip of the tail and by opening the abdominal cavity directly from the heart of each animal before sacrifice the rats, and transferred immediately to a clean dried test tube containing anticoagulant at a ratio of 1:10 for hematological studies (Total Erythrocyte Count and Haemoglobin concentration) and another 1ml of blood was collected from each animal to collect serum for biochemical studies (SGPT, SGOT and ALP).

Statistical analysis:

The experimental data were designed in CRD and analyzed statistically using one way analysis of variance with help of the MSTAT software and DMRT were also done for ranging.

3. RESULTS

The experiment was carried out to study the toxicity of the leaves of *Datura stramonium* in rats like body weight gain and different hemato-biochemical parameters like Total Erythrocyte Count (TEC) Hemoglobin Concentration, Serum Glutamate Oxaloacetate Transaminase (SGOT IU/L), Serum Glutamate Pyruvate Transaminase (SGPT IU/L) and Serum Alkaline Phosphatase (ALP IU/L). The result was given in (Table 1, 2, 3, 4, 5, 6).

Table 1. Effects of datura leaves on body weight (g) in rats

	Body weight (g)			
	0 days	14 days	28 days	%
T ₀ (Control)	212.7±0.39	214.2±0.73 a	218.6±0.65 a	2.77
T ₁ (paste of whole leaves of datura @ 50mg/kg body wt.)	210.9±0.64	211.6±0.73 a	211.2±0.62 b	0.14
T ₂ (paste of whole leaves of datura @ 100mg/kg body wt.)	211.7±0.85	212.2±1.30 a	208.9±0.79 c	-1.32
T ₃ (paste of whole leaves of datura @ 200mg/kg body wt.)	211.6±1.28	208.4±1.52 b	207.6±1.19 c	-1.89
Level of significance	NS	**	**	

Table 2. Effects of datura leaves on TEC (million/mm³) in rats

	TEC (million/mm ³)			
	0 days	14 days	28 days	%
T ₀ (Control)	7.223±0.07	7.443±0.01 ^a	7.553±0.06 ^a	4.57
T ₁ (paste of whole leaves of datura @ 50mg/kg body wt.)	7.243±0.06	7.237±0.03 ^b	7.190±0.04 ^b	-0.73
T ₂ (paste of whole leaves of datura @ 100mg/kg body wt.)	7.213±0.03	7.210±0.02 ^b	7.197±0.04 ^b	-0.22
T ₃ (paste of whole leaves of datura @ 200mg/kg body wt.)	7.267±0.02	7.210±0.02 ^b	7.160±0.02 ^b	-1.47
Level of significance	NS	**	**	

Table 3. Effects of datura leaves on Hb (g%) in rats

Group	Hb (g%)			
	0 days	14 days	28 days	%
T ₀ (Control)	13.55±0.05	13.57±0.12 ^b	13.72±0.4 ^a	1.25
T ₁ (paste of whole leaves of datura @ 50mg/kg body wt.)	13.56±0.01	13.55±0.04 ^c	13.49±0.02 ^b	-0.52
T ₂ (paste of whole leaves of datura @ 100mg/kg body wt.)	13.54±0.01	13.29±0.05 ^c	13.21±0.03 ^c	-2.44
T ₃ (paste of whole leaves of datura @ 200mg/kg body wt.)	13.57±0.02	13.15±0.08 ^a	12.95±0.10 ^d	-4.57
Level of significance	NS	**	**	

Table 4. Effects of datura leaves on SGPT (IU/L) in rats

Group	SGPT (IU/L)			
	0 days	14 days	28 days	%
T ₀ (Control)	60.45±1.2	60.40±0.75 ^c	65.30±0.75 ^d	8.02
T ₁ (paste of whole leaves of datura @ 50mg/kg body wt.)	61.17±0.76	71.13±1.11 ^b	75.43±0.87 ^c	23.31
T ₂ (paste of whole leaves of datura @ 100mg/kg body wt.)	60.80±1.10	70.20±1.21 ^b	78.50±1.31 ^b	29.11
T ₃ (paste of whole leaves of datura @ 200mg/kg body wt.)	61.10±0.82	84.30±1.46 ^a	99.40±1.75 ^a	62.68
Level of significance	NS	**	**	-

Table 5. Effects of datura leaves on SGOT (IU/L) in rats

Group	SGOT (IU/L)			
	0 days	14 days	28 days	%
T ₀ (Control)	152.4±1.41	158.4±1.10 ^c	165.6±1.11 ^d	8.66
T ₁ (paste of whole leaves of datura @ 50mg/kg body wt.)	152.4±1.40	160.7±1.02 ^c	165.7±1.46 ^c	8.73
T ₂ (paste of whole leaves of datura @ 100mg/kg body wt.)	152.4±0.78	163.3±0.82 ^b	174.7±1.21 ^b	14.63
T ₃ (paste of whole leaves of datura @ 200mg/kg body wt.)	153.2±0.91	177.6±0.76 ^a	187.1±0.75 ^a	22.13
Level of significance	NS	**	**	

Table 6. Effects of datura leaves on ALP (IU/L) in rats

Group	ALP (IU/L)			
	0 days	14 days	28 days	%
T ₀ (Control)	155.2±1.45	157.8±1.25 ^d	161.7±2.26 ^d	4.19
T ₁ (paste of whole leaves of datura @ 50mg/kg body wt.)	154.3±1.2	163.7±0.95 ^c	164.6±1.45 ^b	6.68
T ₂ (paste of whole leaves of datura @ 100mg/kg body wt.)	156.0±0.96	166.4±1.7 ^b	167.5±1.18 ^b	7.37
T ₃ (paste of whole leaves of datura @ 200mg/kg body wt.)	154.3±0.57	172.4±0.89 ^a	186.2±1.05 ^a	20.67
Level of significance	NS	**	**	

4. DISCUSSION

The body weight of rats of group T₀ (control group) increased gradually during the treatment period. The body weight of the rats of group T₃ was significantly (P<0.01) reduced, but in group T₁ and group T₂ body weight were slightly reduced but statistically not significant during the treatment period. In accordance to the present findings significantly (P<0.01) reduced body weight was also observed the toxic delirium due to *Datura stramonium* in rats by Kruzbaum *et al.*, (2001) and Pretorius E *et al.*, (2006). Hilaly et al (2004) reported that since the changes in body weight seen was used as an indicator of adverse effects of drugs and chemicals, weight gain were not significantly different in the treated rats as compared to control group. Gidado *et al.*, (2007) studied the toxicity of ethanol extract of leaves of *Datura stramonium* in rats. The TEC values in rats were decreased (1.47%) significantly (P<0.01) in group T₃ in relation to control group (T₀). The reduction of TEC values in other two groups T₁ and T₂ were 0.73% and 0.22% respectively which were less than T₃ group. In group T₃ hemoglobin contents were significantly reduced in relation to control group (T₀). The reduction of Hb values in other two groups T₁ and T₂ were less than T₃ group. Similar to present findings, reduction of hematological parameters by the toxic effect of leaves of *Datura stramonium* has been reported by many authors. Forrester (2006) found that TEC and Hb values were significantly (P<0.01) reduced in datura treated rats. Friedman (2004) observed significantly (P<0.01) decreased TEC and Hb in datura treated rats. Halpern (2004) also reported a significant (P<0.01) reduction in TEC and Hb values (P<0.01) was observed in hallucinogens and dissociative agents naturally growing in the USA. The causes of change in hematological values might be due to the toxic effect of datura on hematopoietic system which is responsible for such alterations in hematological parameters.

The SGPT values in rats were increased significantly (P<0.01) in the paste of whole leaves of datura fed group T₃ in relation to control group (T₀). But the increasing percentage of SGPT

values in other two groups (T_1 and T_2) was less than group T_3 . The SGOT values in rats were also increased significantly ($P < 0.01$) in the paste of whole leaves of datura fed group T_3 in relation to control group (T_0). But the increasing percentage of SGOT values in other two groups (T_1 and T_2) which were less than group T_3 . The ALP values in rats were also increased significantly ($P < 0.01$) in the paste of whole leaves of datura fed group T_3 in relation to control group (T_0). But the increasing percentage of SGOT values in other two groups (T_1 and T_2) which were less than group T_3 . The findings of present research work reveal that *Datura stramonium* has a toxic effect to the body resulting reduced body weight and alterations on clinical signs, some hematological and biochemical parameters depending upon the duration of treatment and dose. The present study is a preliminary work on the toxic effect of *Datura stramonium* in rats. However, the result of this research work will certainly help the future researchers to provide guidance in carrying out detailed study on this aspect in Bangladesh and abroad.

5. ACKNOWLEDGEMENT

We are thankful to International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR'B), Mohakhali, Dhaka, Bangladesh and Physiology and Pharmacology department for providing all types of logistic supports and the facilities for the conduction of the experiment.

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