Safety evaluation of *Asparagus racemosus*: a commonly used herb of Ayurvedic Medicine in Charles Foster rats

D Chanda, K Patider, A Pal, Suaib Luqman*, D U Bawankule, D Mani, N P Yadav

Bioprospection Group
Central Institute of Medicinal & Aromatic Plants
(Council of Scientific and Industrial Research) Lucknow – 226015, India
* Presenting author current address: College of Pharmacy, University of Hawaii, Hilo, USA

Asparagus racemosus

Asparagus racemosus Wild. Is one of the most important medicinal plant which is regarded as a 'Rasayana' in the Ayurvedic systemic of Medicine and is commonly known as satavari, satamuli or satawar in India (Indian Journal of Medical Sciences 2003, vol. 57, Pp 408-414).

The major active constituents of *Asparagus racemosus* are steroidal saponins (shatavarins I-IV).

- *Asparagus racemosus has been used in Ayurveda as a galactagogue, aphrodisiac, anodyne, diuretic, antispasmodic and as a nervine tonic since time immemorial (Journal of Ethnopharmacology 2007 Vol 110 pp 1-15; Database on Medicinal Plants used in Ayurveda (2001) CCARS, Govt. of India.*
- *Data is absent regarding toxicity and safety of Asparagus racemosus.*
- *There is only one report available on the toxicity profile of Asparagus racemosus by Leng et al., 2004 which is native to Africa (African Journal o Biomedical Research 2004, vol.7 Pp 19-21).*

With this background information the present experiment envisaged acute and sub acute toxicity of Asparagus racemosus root aqueous in Charles Foster Rat

Materials and Methods

- *Animal: 6 to 8 weeks old male and female Charles Foster (CF) rat.*
- *Preparation of Asparagus racemosus root aqueous extract: Roots were obtained from medicinal plant garden of CIMAP (CSIR, India), dried at 30-38oC under shade and a voucher specimen of the root sample was deposited in the herbarium of CIMAP. The roots were then grinded to coarse powder by 18 mesh size plate. To one part of dried powder, four parts of distilled water was added, soaked overnight, filtered through muslin cloth followed by whatman filter paper and repeated thrice. Finally the pooled filtrate was concentrated by vacuum evaporation. The concentrated extract was then chemically fingerprinted using HPTLC before using for animal experimentation.*
- *Acute toxicity: Twenty CF rats of either sex were taken and divided into 5 groups having 2 male and 2 female rats in each group. Animals of group 1 were kept as control and were treated with distilled water while animals of group 2, 3, 4 and 5 were kept as experimental and were treated with the extract as a single oral dose at 2000, 3000, 4000 and 5000 mg/kg body weight respectively.*
- *Sub acute toxicity: Thirty six CF rats of either sex were taken and divided into 6 groups having 3 male and 3 female rats in each group. Animals of group 1 were kept as control and were treated with distilled water while animals of group 2, 3, 4, 5 and 6 were kept as experimental and were treated with the extract as a single dose once orally for 28 days at 2000, 3000, 4000 and 5000 mg/kg body weight respectively.*

Parameters studied:

Observational Study: Morbidity and mortality if any during the entire experimental period including activity, skin texture alertness etc.

Hematological and Biochemical study: Blood and serum samples were collected from control and experiment animals on 7th day in acute study and on 28th day in sub acute study. The samples thus obtained were analyzed for total WBC, total RBC count and serum chemistry for liver function, kidney function tests and lipid profiles. Hepatic tissue samples obtained on completion of experiments were analyzed for reduced glutathione and malonaldehyde content.

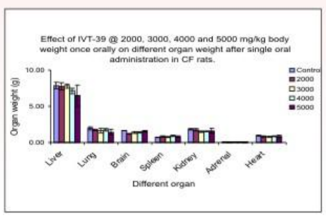
Pathological Study: On completion of experiments, animals were sacrificed on 7th day in acute study and on 28th day in sub acute study and vital organs like brain, heart, liver, spleen, lungs etc. were collected, necropsed and weighed. In addition, hepatic tissues of sub acute experiments studied for histopathological changes.

Results: Acute toxicity

No morbidity and mortality was observed during the experimental period.
Effects of Asparagus racemosus root aqueous extract at 2000, 3000, 4000 and 5000 mg/kg body weight once orally on body weight, hematological and serum biochemical parameters (n = 4) (, P<0.05; **, P<0.01).*

Parameter	Dose of Asparagus racemosus root aqueous extract at mg/kg as a single oral dose				
	Control	2000 mg/kg body wt	3000 mg/kg body wt	4000 mg/kg body wt	5000 mg/kg body wt
BODY WEIGHT (g)	221.16±14.23	224.85±18.3	218.47±15.7	221.12±16.4	211.80±45.1
HAEMOGLOBIN (g/dl)	9.26±0.73	10.21±0.90	9.98±0.86	10.07±1.19	10.88±0.18
RBC (million/ml)	4.46±0.21	4.61±0.28	5.38±0.61	4.87±0.36	4.89±0.47
WBC (1000/ml)	6.20±0.70	6.30±0.85	6.39±1.21	5.60±0.81	4.46±0.1
SGOT (U/L)	29.78±5.03	34.71±6.98	34.80±4.99	44.61±2.29	48.71±7.65
SGPT (U/L)	18.15±2.90	7.94±1.01	10.81±1.15	11.84±1.59	8.79±2.90
ALKP (U/L)	195.05±34.12	236.12±57.7	125.55±37.8	165.12±13.6	185.21±45.4
CHOLESTROL (mg/dl)	161.20±9.74	162.76±11.7	149.82±10.11	154.35±3.21	189.51±8.85
TRIGLYCERIDES (mg/dl)	109.27±22.84	115.40±15.2	105.42±2.48	67.55±21.2	64.86±22.9
BUN (mg/dl)	10.26±2.50	11.58±2.45	14.23±2.49	12.56±1.58	11.72±2.56
CREATININE (mg/dl)	0.57±0.05	0.51±0.07	0.82±0.22	1.06±0.06 **	1.20±0.05 **
TOTAL serum Protein (mg/ml)	57.2±4.80	57.4±15.5	58.6±16.9	58.8±16.7	58.07±2.65
ALBUMIN (g/dl)	3.29±0.20	3.30±0.31	3.85±0.83	3.24±0.28	3.61±0.09
ALBUMIN-GLOBULIN ratio	1.48±0.35	1.44±0.32	1.99±0.35	1.34±0.30	1.43±0.14
Malonaldehyde (nmole/mg protein)	0.05 0.000	0.04 0.004	0.05 0.013	0.04 0.005	0.04 0.006
GSH (µmole/mg protein)	7.61 0.257	5.83 0.731	6.88 0.741	6.43 0.580	6.75 0.342

Effect of Asparagus racemosus root aqueous extract at 2000, 3000, 4000 and 5000 mg/kg body weight as a single oral dose on different organs weight in CF rats. (Mean ± SE); n=4.

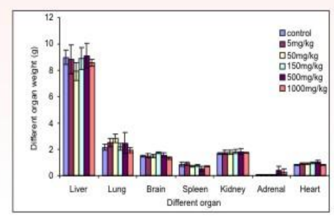


Results: sub acute toxicity

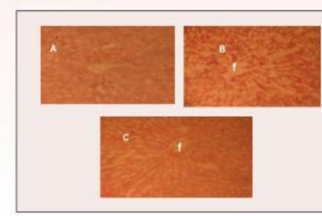
No morbidity and mortality was observed during the experimental period.
Effects of *Asparagus racemosus* root aqueous extract at 5, 50, 150, 500 and 1000 mg/kg body weight as a single dose once orally for 28 days on body weight, hematological and serum biochemical parameters (n = 6) (* P<0.05; ** P<0.01).

Parameters studied	Asparagus racemosus root aqueous extract @ mg/kg body weight once orally for 28 days					
	control	5 mg/kg	50 mg/kg	150 mg/kg	500 mg/kg	1000 mg/kg
BODY WEIGHT (g)	225.87±11.56	242.20±14.58	247.20±14.57	246.69±25.16	270.31±25.22	251.74±12.83
HAEMOGLOBIN (g/dl)	12.85±0.81	16.27±1.30	12.89±0.84	11.84±1.83	13.48±1.37	14.08±1.28
RBC (million/ml)	5.71±0.31	6.03±0.16	6.20±0.28	6.71±0.38	6.88±0.20	5.81±0.30
WBC (1000/ml)	7.38±0.75	7.58±1.02	8.18±0.42	7.56±2.24	7.75±1.91	8.47±2.24
SGOT (U/L)	28.71±3.86	31.89±2.78	24.48±1.64	28.54±2.24	25.48±3.28	23.38±3.41
SGPT (U/L)	6.86±0.71	8.93±1.28	11.20±1.20***	16.21±8.30*	8.45±8.40*	9.88±8.83*
ALKP (U/L)	204.85±58.48	313.14±50.23	215.85±44.26	277.82±52.73	252.66±62.54	236.45±27.80
CHOLESTROL (mg/dl)	165.26±8.74	182.76±11.47	148.82±10.11	154.38±3.21	189.51±8.85	173.26±41.55
TRIGLYCERIDES (mg/dl)	94.29±7.4	61.93±8.796	40.01±8.0461	49.6±6.7282	33.21±7.038	48.82±8.8694
BUN (mg/dl)	24.65±6.47	22.30±1.50	21.19±1.26	22.13±6.76	16.01±0.42*	26.88±1.85
CREATININE (mg/dl)	0.19±0.08	0.27±0.10	0.27±0.08	0.51±0.11	0.26±0.03	0.69±0.19*
TOTAL serum Protein (mg/ml)	42.16±16.83	44.77±26.97	33.28±17.86	42.62±12.43	45.06±5.03	42.86±19.28
ALBUMIN (g/dl)	3.02±0.58	2.79±0.31	3.30±0.14	3.25±0.23	3.66±0.27	4.60±0.77
ALBUMIN-GLOBULIN ratio	3.58±0.78	2.29±0.64	4.72±0.67	2.42±0.24	3.09±0.60	5.35±1.22
Malonaldehyde (nmole/mg protein)	0.17±0.03	0.17±0.05	0.20±0.04	0.25±0.04	0.11±0.04	0.17±0.03
GSH (µmole/mg protein)	0.14±0.01	0.14±0.02	0.16±0.01	0.11±0.01	0.09±0.02	0.15±0.02

Effect of Asparagus racemosus root aqueous extract at 5, 50, 150, 500 and 1000 mg/kg body weight as a single oral dose once daily for 28 days on different organs weight in CF rats. (Mean ± SE); n=6.



Histopathology: section of liver of Charles Foster rats on 28th day post treatment in sub acute experiment with the aqueous extract showing fatty changes (f). A, control; B, 500 mg/kg body weight; C, 1000 mg/kg body weight (H. & E. 200X).



Observations:

No morbidity or mortality or any observational changes were found in routine case side examinations in any of the animals.
In the present toxicity study, all the parameters studied showed non significant changes except

1. *Significant increase in serum creatinine level at 4000 and 5000 mg/kg body comparedto control in acute study.*
2. *Significant increase in creatinine level at 1000 mg/kg, SGPT activity at 50, 150, 500 and 1000 mg/kg and decrease in BUN level at 500 mg/kg compared to respective control in sub acute study.*
3. *Histopathological examination showed mild fatty changes at 500 and 1000 mg/kg body weight in sub acute experiment.*

Conclusions:

From our observation it can be concluded that aqueous extracts of Asparagus racemosus root is well tolerated in both acute and sub acute experiments by Charles Foster rats except some biochemical and histopathological changes at higher doses.
However, a detailed chronic exposure study is to be carried out to look for any adverse effects in CF rats and to look for its mechanisms of toxicity if any.