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COMPARATIVE STUDIES OF LOW AND HIGH DOSE OF *SHATAVARI* WITH *ASHWAGANDHA* AGAINST VARIOUS MODELS OF ADAPTOGENIC ACTIVITY

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Abstract:
Objectives: *To study the adaptogenic activity of the root extracts of Asparagus racemosus (Asparagaceae) in anoxia stress tolerance, cold restrain stress, swimming endurance, cell mediated immune response, immobilization stress models in rats and mice.*
Background: *In traditional system of medicine this plant is widely used for its variety of activities such as anti-inflammatory, antiulcer, antidiarrhoeal, female reproductive tonic. Further no scientific data is available on the adaptogenic activity of the root extracts of this plant. Hence the present study was planned to explore the adaptogenic activity of this plant in various stress induced experimental animal models like rats and mice.*
Materials and method: *Chloroform (CERAR) extracts was prepared by the Soxhlet process and Aqueous (AQERAR) by maceration process. Both extracts were subjected for LD_{50} studies in mice upto the maximum dose level of 2000 mg/kg, p.o, and none of them produced abnormal behavior or mortality. Adaptogenic activity was recorded with three different doses selected from each AQERAR and CERAR noted as low medium and high and tested in anoxia stress tolerance, cold restrain stress, swimming endurance, cell mediated immune response, immobilization stress models in rats and mice and was noted with significant adaptogenic effect.*
Different parameters like BUN (blood urea nitrogen), GLU (blood glucose), CHO (cholesterol) and TRI (triglycerides) and weight of the organs like liver, spleen, adrenal gland, kidney, levels are significantly altered after treatment with doses of both the extracts in adaptogenic rats.
Phytoconstituents like glycosides, saponins, carbohydrates, flavonoids, tannins and phenolic compounds, alkaloids, steroids, proteins and amino acids are already reported for this adaptogenic activity. Some of the phytoconstituents mentioned above are present in both these extracts and these can be accounted for absorbed adaptogenic action.
Keywords: *Asparagus racemosus root extracts, Adaptogenic activity, Anoxia stress tolerance, Cold restrain stress, Swimming endurance, Cell mediated immune response, Immobilization stress.*

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INTRODUCTION:

A common mental illness that affects a person's body, mood, and thought - it causes people to lose pleasure from daily life, can complicate other medical conditions, and can even lead to suicide.

Stress is the peculiar response of the body to any demand which can occur by unexpected changes in life such as going to college, getting married with non selective person, changing jobs, or illness, or biological agents triggering the hypothalamo-pituitary-adrenal axis stress response or the death of a relative or friend are the most common causes of stress[1].

No one wants to feel stressed. Adaptogens are mediators to help your body minimize stress response and recover from anything that is putting you off balance.

The use of natural adaptogens by humans has a rich history. About 50 years ago, plant adaptogens were first used in professional sports due to their high potential to increase the body's resistance to stress and to improve physical endurance.

There are three qualities that plants must have to be an adaptogen:

- It is non-toxic when taken in normal doses.
- It helps your body cope with stress.
- It allows your body to return to balance (homeostasis).[2]

In 20th century Researchers are diverting their mind from using synthetic medicine to natural plants for many aliments because of minimum or no side effects. Several authors have shown that the species from different localities often differ in their chemical constituents and contents. The genus *Asparagus* includes about 300 species around the world. The genus is considered to be medicinally important because of the presence of steroidal saponins and sapogenins in various parts of the plant. Out of the 22 species of *Asparagus* recorded in India, *Asparagus racemosus* is the one most commonly used in traditional medicine. This plant belongs to *Liliaceae* family, common at low altitudes in shade and in tropical climates throughout India, Asia, Australia and Africa. *Shatavari* has been mentioned in Ayurvedic texts like the Charak Samhita, Susruta Samhita and Astanga Samgraha.[3]

In *Asparagus racemosus* during summer in the region of north Kalaburagi, Karnataka, India. The rhizomes and tuberous roots are inconspicuous and aerial portion dies which is the dormant phase. And also according to 2003 research, ayurvedic medicine considers *shatavari* "absolutely safe for long term use. And in many Ayurvedic preparations *shatavari* is beneficial as growth promoters and immuno-stimulant. In view of this, efforts were made to study the comparative effect of low and high dose of *Shatavari* supplementation on certain antistress parameters such as Anoxia stress tolerance, Swimming endurance test, Cold restraint stress, Cell mediated immune response and Immobilization stress.[4 - 5]

METHODOLOGY AND RESULT::

Preparation of extracts[6]:

The dried roots are to be subjected to size reduction and the coarse powder is packed in a thimble of Soxhlet apparatus and extracted with chloroform for 18 h. The obtained chloroform extract (CERAR) will be dried over water bath under low temperature < 50^0C.

About 100 g of dried powder is taken in a round bottom flask (200 ml) and macerated with 500 ml of distilled water with 10 ml of chloroform (preservative) for 7 days with occasional shaking for every hour in a closed vessel. Then the marc is removed by filtering off the extract and then it is concentrated on a water bath maintained at < 50^0C to get aqueous extract(AQERAR).

Percentage yield of extracts.

S.no	Name of the extract	Nature	Colour	%yield of extact (w/w)
1	Aqueous	Sticky	Brown	42 g
2	Chloroform	Non-Sticky	Light Brown	3.2 g

Experimental procedures: -

Each animal was kept in the hermetic vessel and as soon as the animal shows the first sing of convulsion, it was removed from the vessel. The time duration from the entry of the animals to the hermetic vessel and the appearance of the first convulsions were noted and a delay of even one minute in removal of the animal may lead to death of the animals. After one week of drug treatment the animals was once again exposed to anoxia stress. Depending upon their capacity of tolerance, the animals were observed for the 2nd, 3rd week with the same treatment and the change in time duration was observed[7,8,9].

EVALUATION OF ADPTOGENIC CTIVITY

A. Swimming endurance test.

Stress control animals swim for about 30 minutes. It was observed that there was increased in the swimming time compared with standard and Chloroform extract treated groups. Therefore, chloroform extracts have better activity then aqueous extracts.

Effect of swimming endurance test on biochemical parameters.

Biochemical parameters like glucose, cholesterol, triglycerides, BUN were found to be increased in the stress control animals with compare to normal control group. But after treatment with standard drug all the biochemical parameters found to be significantly reduced. However significant reduction in glucose, cholesterol, triglycerides, BUN were observed with Choloroform extract treatment have better activity then aqueous extracts.

Effect of swimming stress on organ weight.

Weight of liver, kidney, adrenal glands were found to be increased and weight of spleen was decreased during stress conditions as compare to normal control animals. from the results it was found that chloroform extracts have produce significant reduction in the weight of the liver, kidney and adrenal gland and increases the weight of the spleen, and there was no significant reduction of weight of liver, kidney, adrenal gland and increase in the weight of the spleen were observed with the aqueous extract.

Effect of swimming stress test on blood cell count.

Standard drug and chloroform extracts of roots of *Asparagus racemosus* has reduced RBC, WBC, DLC count those were onceased during stress compare to normal control group, while aqueous extract had not significantly reduced the RBC, WBC, DLC count.

Effect of swimming stress test on Ulcer index.

Swimming stress produced ulcer in animals. Standard drug and chloroform extracts of roots of *Asparagus racemosus* have significantly protected the swimming stress induced ulceration while aqueous extracts have not significantly prevented the ulcers.

B. Immobilization stress[10-11]

Effect of Immobilization stress on biochemical parameters

From the study it was observed that standard drug and have exhibited significant antistress activity in Immobilization stress by reducing elevated levels of blood glucose, cholesterol, BUN and triglycerides in rats, while aqueous and petroleum extracts did not altered these parameters significantly.

Effect of cold stress on organ weights.

Organ weights of liver, kidney, adrenal gland were increased during stress and weight of spleen was decreased in immobilization stress in rats as compare to normal rats. there was a decreased in the weight of liver, kidney, adrenal gland and increase in the weight of spleen with Chloroform extracts treated groups, while aqueous extract had not produce any significant alteration in all these parameters

C. Cold restrain stress[12-13]

Effect of cold stress on biochemical parameters

From the study it was observed that standard drug and have exhibited significant antistress activity in cold induced stress by reducing elevated levels of blood glucose, cholesterol, BUN and triglycerides in rats, while aqueous and petroleum extracts did not alter these parameters significantly.

Effect of cold stress on organ weights.

Organ weights of liver, kidney, adrenal gland were increased during stress and weight of spleen was decreased in cold induced stress in rats as compare to normal rats. there was a decreased in the weight of liver, kidney, adrenal gland and increase in the weight of spleen with Chloroform extracts treated groups, while aqueous extract had not produce any significant alteration in all these parameters.

E. Cell –mediated immune response[14]

Cell-mediated immune response is a delayed type hypersensitivity which is manifested after 2-3 days of exposure to antigens. The SHRBC has produce local inflammation on the left hind paw of the rats, the right leg did not produce any inflammation as saline was administered into the right leg. We observed that there was a decrease in the inflammation in stress animals as compare to normal because cortisol prevents the release of substances in the body that cause inflammation. The activation of the stress system (and resulting increase in cortisol and Th2 shift) seen during an infection is believed to be protective mechanism which prevents an over-activation of the inflammatory response.

F. Anoxia stress tolerance test[14]

Pretreatment with aqueous extracts and chloroform extracts (100 mg/kg, 200mg/kg, 400 mg/kg) p.o. for 1,2 and 3 weeks have significantly increased the anoxia stress tolerance time as compared to vehicle treated group. However, higher dose of chloroform extract had significantly increase the anoxia stress tolerance time.

Effect of root extracts of *Asparagus racemosus* on Biochemical Parameters in Swimming Endurance test in Rats

Blood Glucose

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	81.66	128.10	101.30	114.10	112.06	112.03	116.20	111.12	108.30
B	80.29	127.05	104.20	112.03	111.10	112.14	113.14	110.20	110.06
T	83.46	126.30	104.25	114.14	110.20	112.15	113.20	111.02	110.00
HB	81.10	128.05	103.10	115.01	113.24	112.14	114.20	109.98	109.21
BT	85.30	127.16	102.14	113.25	111.11	112.30	115.14	110.30	107.25
HT	81.32	125.03	105.18	115.20	111.26	111.11	116.21	111.01	109.36
Mean ±SEM	82.18± 0.755***	129.58± 0.4724	105.01± 0.5947***	115.27± 0.480***	113.46± 0.424***	112.32± 0.177***	116.21± 0.567***	111.18± 0.204***	110.24± 0.441***

Triglycerides

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	56.09	77.08	63.91	75.15	72.15	70.91	74.86	70.23	68.95
B	55.68	79.23	64.51	74.16	73.98	72.45	75.05	72.45	69.52
T	56.71	79.85	62.94	75.03	74.10	70.62	74.12	70.62	70.54
HB	55.81	78.52	64.25	74.21	74.16	71.12	75.23	71.12	71.01
BT	54.94	78.07	64.01	75.26	74.10	72.58	73.91	72.58	70.15
HT	55.96	78.84	63.98	73.25	75.55	73.06	75.04	73.06	71.56
Mean ±SEM	55.86± 0.235***	79.95± 0.392	64.74± 0.218***	75.12± 0.318***	74.16± 0.442***	73.19± 0.418***	75.24± 0.224***	73.01± 0.477***	71.24± 0.391***

Cholesterol

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	123.01	260.12	139.65	156.02	153.03	150.85	145.02	143.86	141.73
B	122.96	263.12	138.54	154.98	152.16	151.65	146.85	144.03	142.98
T	123.21	265.32	139.25	153.97	151.98	153.06	144.23	144.10	143.56
HB	121.01	264.98	137.45	155.16	150.87	151.75	144.13	144.16	142.57
BT	122.06	262.13	140.21	156.03	153.65	152.06	145.21	143.86	140.99
HT	121.96	260.96	138.97	155.98	154.16	152.25	146.10	144.01	142.86
Mean ±SEM	122.36± 0.345***	263.88± 0.860	140.96± 0.390***	156.21± 0.335***	154.32± 0.492***	152.95± 0.298***	146.21± 0.433***	144.26± 0.433***	142.18± 0.380***

BUN

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	26.40	44.45	30.18	42.12	43.01	41.61	38.16	35.15	34.16
B	26.40	44.23	29.16	44.16	42.95	40.16	37.82	36.00	35.18
T	26.41	45.16	30.15	43.59	40.86	42.54	36.61	35.16	33.19
HB	26.31	44.23	28.95	44.16	42.74	41.43	38.06	34.99	35.20
BT	26.86	44.15	29.56	43.98	41.66	42.29	37.27	36.03	36.22
HT	26.20	44.63	28.64	44.03	42.83	40.36	38.08	35.16	35.29
Mean ±SEM	26.41± 0.092***	45.08± 0.154	30.65± 0.259***	44.56± 0.322***	43.08± 0.359***	42.01± 0.398***	38.28± 0.249***	36.19± 0.191***	35.60± 0.429***

Effect of root extracts of *Asparagus racemosus* on Weight of Organs in Swimming Endurance test in Rats

Liver

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	2.29	5.501	4.418	4.501	4.412	4.416	4.150	3.490	4.201
B	3.01	4.498	3.425	3.498	3.498	3.425	3.950	3.481	3.394
T	3.58	5.000	4.399	4.478	4.450	4.394	4.015	4.011	4.416
HB	2.91	4.506	4.443	4.501	4.410	3.486	3.103	4.400	3.456
BT	2.85	5.512	3.498	3.485	3.498	4.342	3.987	3.386	4.226
HT	3.60	5.504	4.410	4.006	4.410	4.400	4.018	4.444	3.551
Mean ±SEM	3.04± 0.2018***	5.527± 0.2015	4.470± 0.2015***	4.510± 0.2009***	4.480± 0.1946***	4.473± 0.1970***	4.620± 0.1560***	4.515± 0.1967***	4.508± 0.1857***

Spleen

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.401	0.325	0.518	0.511	0.506	0.528	0.511	0.520	0.500
B	0.393	0.316	0.520	0.525	0.520	0.521	0.503	0.506	0.511
T	0.403	0.315	0.530	0.529	0.524	0.516	0.510	0.511	0.516
HB	0.404	0.329	0.518	0.517	0.516	0.518	0.500	0.510	0.521
BT	0.403	0.319	0.526	0.534	0.523	0.529	0.519	0.504	0.499
HT	0.404	0.345	0.536	0.529	0.530	0.532	0.520	0.500	0.436
Mean ±SEM	0.404± 0.0017***	0.378± 0.0045	0.564± 0.0029***	0.528± 0.0035***	0.535± 0.003 ***	0.546± 0.002***	0.530± 0.0033***	0.525± 0.0028***	0.520± 0.012***

Adrenal gland

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.014	0.021	0.015	0.019	0.008	0.015	0.011	0.006	0.010
B	0.010	0.022	0.016	0.020	0.010	0.010	0.015	0.014	0.011
T	0.012	0.025	0.012	0.021	0.011	0.009	0.018	0.018	0.005
HB	0.014	0.026	0.011	0.014	0.005	0.016	0.019	0.009	0.009
BT	0.011	0.028	0.009	0.016	0.014	0.016	0.011	0.010	0.010
HT	0.015	0.024	0.010	0.018	0.020	0.016	0.007	0.011	0.015
Mean ±SEM	0.014± 0.0008***	0.029 ± 0.001	0.018± 0.001***	0.027± 0.0010*	0.026± 0.002***	0.025± 0.0013***	0.026± 0.0018***	0.024± 0.0017***	0.022± 0.0017***

Kidney

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.711	1.011	0.825	0.819	0.825	0.816	0.813	0.800	0.716
B	0.710	0.980	0.814	0.820	0.796	0.815	0.716	0.712	0.841
T	0.700	1.010	0.795	0.841	0.843	0.798	0.815	0.816	0.715
HB	0.710	1.016	0.801	0.765	0.816	0.816	0.794	0.719	0.817
BT	0.712	1.006	0.784	0.801	0.794	0.726	0.816	0.816	0.746
HT	0.711	1.014	0.815	0.756	0.819	0.825	0.725	0.784	0.826
Mean ±SEM	0.711± 0.0018***	1.023± 0.0054	0.848± 0.006***	0.875± 0.013***	0.873± 0.007***	0.870± 0.015***	0.854± 0.019***	0.852± 0.019***	0.850± 0.023***

Effect of root extracts of *Asparagus racemosus* on Biochemical Parametres in Swimming Endurance test in Rats.

S.NO	Treatment	Dose (mg/kg)P.O.	Blood Glucose mg/dl	Triglycerides mg/dl	BUN mg/dl	Cholestrol mg/dl
1	Control	10ml	82.18±0.744***	55.86±0.2357	26.41±0.08053	122.36±0.3453
2	Stress Control	10ml	129.58±0.954	79.95±0.4501	45.08±0.06015	263.88±0.1700
3	Standard (*W. somnifera*)	100mg/kg	105.01±0.665***	64.74±0.5396***	30.65±0.003652***	140.96±0.2580***
4	AQERAR	100mg/kg	115.27±1.326***	75.12±0.3160***	44.56±0.006009***	156.21±19.06***
5	AQERAR	200mg/kg	113.46±0.3654***	74.16±0.2662***	43.08±0.002582***	154.21±0.2800***
6	AQERAR	400mg/kg	112.32±0.4540***	73.19±0.3544***	42.01±0.004216***	154.32±0.3121***
7	CERAR	100 mg/kg	116.21±0.4960***	75.24±0.4682***	38.28±0.01759***	152.95±0.3538***
8	CERAR	200 mg/kg	111.18±0.2734***	73.01±0.5090***	36.19±0.004773***	146.21±0.2061***
9	CERAR	400 mg/ kg	110.24±0.504***	71.24±0.2764***	35.60±0.004773***	144.26±0.2319***

(Mean±SEM)

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,

AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus*.

Effect of root extracts of *Asparagus racemosus* on Weight of Organs in Swimming Endurance test in Rats.

S.NO	Treatment	Dose (mg/kg) P.O.	Liver gm	Spleen gm	Kidney gm	Adrenal gland gm	Ulcers
1	Control	10ml	3.04±0.2018***	0.404±0.000562	0.711±0.00025	0.014±0.0004282	0.00±0.0
2	Stress Control	10ml	5.527±0.2018	0.378±0.004	1.023±0.0054	0.029±0.001	0.815±0.003
3	Standard (*W. somnifera*)	100mg/kg	4.470±0.2015***	0.545±0.0029***	0.848±0.006***	0.018±0.001	0.119±0.016***
4	AQERAR	100mg/kg	4.510±0.2009***	0.555±0.0035***	0.875±0.013***	0.027±0.001*	0.621±0.001*
5	AQERAR	200mg/kg	4.480±0.1946***	0.565±0.0035***	0.873±0.007***	0.026±0.002***	0.556±0.003***
6	AQERAR	400mg/kg	4.473±0.1970***	0.568± 0.003 ***	0.870±0.015***	0.025±0.001***	0.481±0.0019***
7	CERAR	100 mg/kg	4.620±0.1560***	0.558±0.002***	0.854±0.019***	0.026±0.001***	0.560±0.005***
8	CERAR	200 mg/kg	4.515±0.1967***	0.567±0.0033***	0.852±0.019***	0.024±0.001***	0.420±0.004***
9	CERAR	400 mg/ kg	4.508±0.1857***	0.570±0.0028***	0.850±0.023***	0.022±0.001***	0.323±0.005***

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,

AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus.*

Effect of root extracts of *Asparagus racemosus* on Blood Count in Swimming Endurance test in Rats. (Mean±SEM)

S.NO	Treatment	Dose (mg/kg)P. O.	RBC Million cells/ccm	WBC Million cells/ccm	Diffrential Leucocytes Count			
					Neutrophils	Monocytes	Eosinophils	Lymphocytes
1	Control	10ml	6.50±0.05776**	9000± 225.3^{ns}	27%± 25.83*	1%± 1.167**	2%± 0.2857^{ns}	72%±1.232^{ns}
2	Stress Control	10ml	7.82±0.1330	12520± 1804	42%± 40.00	4%± 2.667	5%± 0.6494	83%± 0.8165
3	Standard(*W.somnifera*)	100mg/kg	6.69±0.1825*	10170± 14356^{ns}	35%± 32.33 ^{ns}	2%± 1.500***	3%± 0.4364^{ns}	75%± 0.4880^{ns}
4	AQERAR	100mg/kg	6.82±0.1710*	1700± 18329^{ns}	38%± 46.00 ^{ns}	4%± 2.333**	5%± 0.7377^{ns}	78%±0.5345^{ns}
5	AQERAR	200mg/kg	6.79±0.1730***	10650± 18156^{ns}	37%± 36.50 ^{ns}	3%±*** 2.333	4%± 0.6494^{ns}	77%±0.5345^{ns}
6	AQERAR	400mg/kg	6.75±0.1500*	10540± 19015^{ns}	36%± 33.83 ^{ns}	3%± 2.167***	4%± 0.7693^{ns}	76%±0.4206^{ns}
7	CERAR	100 g/kg	6.81±0.2601**	11712± 18658^{ns}	37%± 36.00 ^{ns}	5%± 4.500***	5%± 0.8411^{ns}	75%±0.8165^{ns}
8	CERAR	200 g/kg	6.78±0.1265***	10630± 18818^{ns}	36%± 34.50 ^{ns}	3%± 2.167***	4%± 0.565^{ns}	74%±0.5084^{ns}
9	CERAR	400 mg/ kg	6.74±0.09713***	10230± 19576 ^{ns}	35%± 33.17 ^{ns}	2%± 1.167***	3%± 0.6901^{ns}	73%±0.6494^{ns}

=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,

AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus n*

Effect of Roots extracts of *Asparagus racemosus* on Biochemical parameters in Immobilization stress test in rats

Blood Glucose

Triglycerides

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	56.09	96.89	77.98	84.17	82.98	82.96	82.16	84.28	82.27
B	55.68	97.56	77.32	84.15	82.99	81.98	84.25	82.91	82.28
T	56.71	98.17	78.38	83.92	83.17	82.29	84.10	82.27	82.28
HB	55.81	98.16	78.38	84.17	83.13	82.54	83.15	82.28	82.28
BT	54.94	98.17	78.38	84.15	83.12	82.59	82.99	82.28	82.91
HT	55.96	98.17	78.38	84.16	82.99	82.32	84.25	82.28	84.28
Mean ±SEM	55.86± 0.199***	98.85± 0.232	78.35± 0.151***	84.12± 0.033***	83.05± 0.029***	82.43± 0.114***	83.98± 0.303***	84.05± 0.337***	82.71± 0.2783***

BUN

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	81.66	120.56	110.19	118.24	115.95	114.21	117.01	114.21	113.16
B	80.29	119.98	110.17	118.20	115.23	113.96	117.06	114.25	112.96
T	83.46	120.02	110.08	118.19	115.21	114.03	116.96	113.96	113.08
HB	81.10	120.08	110.16	118.24	115.00	114.21	117.23	117.23	113.21
BT	85.30	120.09	110.24	118.41	115.23	113.86	116.83	116.83	112.90
HT	81.32	120.04	110.58	117.92	115.06	114.11	117.02	117.02	113.11
Mean ±SEM	82.18 ±0.006***	120.12 ± 0.0007	110.230± 0.060***	118.02± 0.060***	115.29± 0.118***	114.06± 0.048***	117.01± 0.045***	114.20± 0.585***	113.07± 0.040***

Cholestrol

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	123.01	227.69	124.96	128.20	128.11	127.96	128.63	127.52	125.98
B	122.96	227.15	125.06	128.40	127.26	127.16	128.15	127.65	126.08
T	123.21	228.16	125.42	128.40	127.98	127.05	127.89	127.63	126.13
HB	121.01	228.56	124.75	128.52	128.11	128.01	127.89	127.63	126.30
BT	122.06	227.95	124.93	127.86	128.10	127.25	128.09	126.99	126.11
HT	121.96	229.42	125.11	128.52	128.10	127.25	128.01	127.65	125.84
Mean ±SEM	122.36± 0.291***	228.15± 0.268	125.03± 0.077***	128.24± 0.087***	127.95± 0.116***	127.54± 0.146***	128.05± 0.095***	127.51± 0.089***	126.84± 0.121***

Effect of Roots extracts of *Asparagus racemosus* on Weight of Organs in Immobilization stress test in rats

Liver

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	2.29	6.24	4.50	5.56	5.56	5.34	5.61	5.56	5.29
B	3.01	6.23	4.59	5.96	5.49	5.29	5.68	5.30	5.24
T	3.58	6.24	4.50	5.70	5.53	5.28	6.65	5.21	5.27
HB	2.91	6.20	4.59	5.69	5.58	5.31	5.70	5.11	5.30
BT	2.85	6.21	4.58	5.80	5.54	5.36	5.69	5.23	5.22
HT	3.60	6.23	4.21	5.45	5.58	5.38	5.64	5.02	5.21
Mean SEM	3.04± 0.2018***	6.22± 0.0067	4.49± 0.05690***	5.76± 0.02792***	5.54± 0.1406***	5.32± 0.01626***	5.66± 0.1646***	5.30± 0.07578***	5.25± 0.01522***

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	26.40	35.30	28.86	32.20	31.10	30.30	31.60	30.32	29.10
B	26.40	34.36	28.85	32.25	31.09	30.29	31.50	30.29	29.09
T	26.41	34.37	28.86	32.24	31.08	30.30	31.53	30.31	29.08
HB	26.31	34.36	28.86	32.20	31.22	30.31	31.53	30.31	29.10
BT	26.86	35.28	28.85	32.19	31.10	30.30	31.54	30.32	29.10
HT	26.40	34.36	28.86	32.19	31.10	30.30	31.54	30.32	29.08
Mean ±SEM	26.41± 0.077***	34.67± 0.1653	28.86± 0.0018***	32.20± 0.1089***	31.10± 0.017***	30.30± 0.002***	31.53± 0.1262***	30.29± 0.005***	29.10± 0.003***

Spleen

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.404	0.199	0.372	0.331	0.331	0.338	0.330	0.334	0.335
B	0.405	0.203	0.373	0.332	0.335	0.340	0.331	0.335	0.336
T	0.404	0.198	0.374	0.335	0.334	0.339	0.334	0.336	0.338
HB	0.403	0.205	0.379	0.334	0.336	0.337	0.36	0.332	0.336
BT	0.404	0.202	0.377	0.335	0.338	0.336	0.330	0.330	0.338
HT	0.403	0.201	0.371	0.333	0.333	0.341	0.331	0.337	0.335
Mean SEM	0.404± 0.3073***	0.201± 0.1054	0.374± 0.1256***	0.333± 0.6667***	0.334± 0.9916***	0.338± 0.07638***	0.331± 0.04837***	0.334± 0.01065***	0.336± 0.05578***

Adrenal gland

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.043	0.201	0.372	0.331	0.331	0.338	0.330	0.334	0.335
B	0.041	0.199	0.373	0.335	0.335	0.340	0.331	0.335	0.336
T	0.042	0.203	0.374	0.334	0.334	0.339	0.334	0.336	0.336
HB	0.043	0.202	0.379	0.336	0.336	0.337	0.336	0.332	0.338
BT	0.043	0.198	0.377	0.338	0.338	0.336	0.330	0.330	0.338
HT	0.041	0.205	0.371	0.333	0.333	0.341	0.331	0.337	0.335
Mean ±SEM	0.041± 0.042***	0.201± 0.401	0.374± 0.365***	0.333± 0.042***	0.334± 0.0***	0.338± 0.577***	0.331± 0.051***	0.334± 0.022***	0.336± 0.033***

Kidney

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.711	1.026	0.964	0.964	0.964	0.949	0.950	0.948	0.948
B	0.718	1.030	0.933	0.963	0.963	0.951	0.951	0.950	0.950
T	0.719	1.029	0.932	0.965	0.962	0.950	0.951	0.951	0.949
HB	0.716	1.028	0.931	0.966	0.965	0.948	0.948	0.947	0.946
BT	0.719	1.027	0.934	0.962	0.966	0.952	0.952	0.952	0.946
HT	0.711	1.032	0.934	0.962	0.962	0.951	0.951	0.948	0.945
Mean ±SEM	0.711± 0.094***	1.029± 0.070	0.933± 0.005***	0.964± 0.005***	0.963± 0.0***	0.950± 0.006***	0.951± 0.056***	0.949± 0.088***	0.947± 0.085***

Effect of Roots extracts of *Asparagus racemosus* on Biochemical Parametres in Immobilization stress test in rats (Mean± SEM)

S.NO	Treatment	Dose (mg/kg) P.O.	Blood glucose mg/dl	Triglycerides mg/dl	BUN mg/dl	Cholestrol mg/dl
1	Control	10ml	82.18±0.6385***	55.86± 0.1992	26.41± 0.07788	122.36± 0.2918
2	Stress Control	10ml	120.12±0.07428	78.35± 0.2320	34.67± 0.1653	228.15± 0.2687
3	Standard (*Withania somnifera*)	100mg/kg	110.230±0.06074***	78.35± 0.1518***	28.86± 0.001844***	125.03± 0.07751***
4	AQERAR	100mg/kg	118.02±0.06047***	84.12± 0.3395***	32.20± 0.1089***	128.25± 0.0880***
5	AQERAR	200mg/kg	115.29±0.1181***	83.05± 0.02963***	31.10± 0.01784***	127.95± 0.1168***
6	AQERAR	400mg/kg	114.06±0.0183***	82.43± 0.1146***	30.30± 0.002182***	127.67± 0.1468***
7	CERAR	100 mg/kg	117.01± 0.04513***	84.05± 0.3037***	31.53± 0.01262***	128.05± 0.09541***
8	CERAR	200 mg/kg	114.20± 0.05850***	83.98± 0.3372***	30.32± 0.005345***	127.51± 0.08977***
9	CERAR	400 mg/ kg	113.07± 0.04094***	82.71± 0.2783***	29.10± 0.003780***	126.07± 0.1218***

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,
AQERAR- Aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus*.

Effect of Roots extracts of *Asparagus racemosus* on Weight of Organs in Immobilization stress test in rats (Mean ± SEM)

S.NO	Treatment	Dose (mg/kg) P.O.	Liver gm	Spleen gm	Kidney gm	Adrenal gland gm
1	Control	10ml	3.04± 0.2018***	0.404± 0.0003	0.711± 0.0009	0.014± 0.00042
2	Stress Control	10ml	6.22± 0.006	0.201± 0.001	1.029± 0.0007	0.043± 0.040
3	Standard (*W.somnifera*)	100mg/kg	4.49± 0.5960***	0.374± 0.0012***	0.933± 0.00051***	0.028± 0.0003***
4	AQERAR	100mg/kg	5.76± 0.072***	0.333± 0.00066***	0.964± 0.00057***	0.035± 0.00042***
5	AQERAR	200mg/kg	5.54± 0.0140***	0.354± 0.00099***	0.963± 0.0***	0.034± 0.0***
6	AQERAR	400mg/kg	5.32± 0.0162***	0.338± 0.00076***	0.950± 0.00069***	0.032± 0.00057***
7	CERAR	100 mg/kg	5.66± 0.1649***	0.331± 0.0048***	0.951± 0.00056***	0.033± 0.0005***
8	CERAR	200 mg/kg	5.30± 0.0757***	0.334± 0.0015***	0.949± 0.0008***	0.031± 0.00022***
9	CERAR	400 mg/ kg	5.25± 0.0152***	0.336± 0.0005***	0.947 ±0.0008***	0.030± 0.0003***

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,
AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus*.

Table No – 20: Effect of Roots extracts of *Asparagus racemosus* on Biochemical parameters in Cold restrain stress test in rats
Blood glucose

S.No	Control	Stress control	Standard 100mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	81.66	112.02	99.90	101.58	103.27	101.92	103.57	101.98	99.90
B	80.29	109.50	98.65	104.29	104.50	99.28	104.29	102.07	101.20
T	83.46	115.29	99.10	106.08	102.90	102.58	102.90	101.07	99.95
HB	81.10	111.92	98.29	110.02	102.98	101.09	102.87	103.09	102.05
BT	85.30	112.15	97.56	103.59	103.98	101.50	103.80	101.09	101.86
HT	81.32	108.65	95.20	101.28	101.94	102.27	102.98	101.99	98.96
Mean ±SEM	82.18± 0.007***	111.53 ± 0.0095	98.11± 0.065***	104.47± 1.326***	103.14± 0.3654***	101.27± 0.4540***	101.44± 0.4960***	101.56± 0.234***	100.65± 0.5045***

Triglycerides

S.No	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400mg/kg
H	56.09	96.78	77.82	82.91	81.94	79.96	83.98	79.96	79.56
B	55.68	95.54	76.91	82.42	83.09	80.56	84.87	78.99	77.68
T	55.81	94.32	77.62	83.56	82.56	81.22	82.56	80.91	78.12
HB	54.94	97.42	75.52	84.08	82.65	82.30	81.67	79.56	77.90
BT	55.96	95.92	74.60	82.31	81.72	80.96	83.99	77.68	78.10
HT	56.71	96.70	77.59	83.98	81.36	81.95	83.21	80.98	77.94
Mean ±SEM	55.86± 0.2357***	96.11± 0.4501	76.67± 0.5396***	83.17± 0.3160***	82.22± 0.2662***	81.15± 0.3544***	83.38± 0.4682***	79.68± 0.5090***	78.22± 0.27***

BUN

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	26.40	33.31	29.64	30.23	30.18	30.13	30.17	30.14	30.10
B	26.40	33.32	29.65	30.22	30.17	30.16	30.08	30.14	30.12
T	26.41	33.37	29.65	30.26	30.19	30.15	30.19	30.16	30.12
HB	26.41	33.36	29.63	30.25	30.18	30.14	30.15	30.17	30.11
BT	26.31	33.56	29.63	30.23	30.18	30.15	30.19	30.15	30.11
HT	26.86	33.10	29.64	30.24	30.18	30.15	30.19	30.15	30.09
Mean ±SEM	26.41± 0.0805***	33.37± 0.0601	29.64± 0.365***	30.24± 0.600***	30.18± 0.025***	30.15± 0.04216***	30.19± 0.0175***	30.17± 0.04773***	30.12± 0.0477***

Cholestrol

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERA 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	123.01	225.10	124.10	127.15	126.50	125.15	125.96	125.10	124.20
B	122.96	225.21	125.20	126.23	125.10	124.19	125.86	126.02	125.20
T	123.21	224.90	124.81	12.31	125.16	125.21	124.08	125.30	125.25
HB	121.01	225.02	123.76	126.32	126.70	123.32	125.71	125.24	124.20
BT	122.06	224.10	125.22	126.42	126.30	125.12	125.01	126.00	124.03
HT	121.96	225.18	125.17	127.07	126.10	125.05	124.09	126.30	124.10
Mean ±SEM	122.3± 0.3453***	224.59± 0.170	124.07± 0.258***	127.23± 19.06***	125.97± 0.280***	124.67± 0.312***	126.06± 0.353***	125.57± 0.206***	124.90± 0.231***

Effect of the extracts of the plant *Asparagus racemosus* on the Weight of Organs in Cold restrain stress test in rats.

Liver

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	2.29	4.77	3.28	5.98	4.29	5.51	4.96	3.209	4.01
B	3.01	5.92	3.16	6.21	4.18	4.12	5.03	3.05	4.10
T	3.58	5.96	4.29	6.05	5.10	4.32	5.07	4.26	4.05
HB	2.91	4.44	4.69	5.55	4.32	3.39	5.05	4.07	4.40
BT	2.85	4.90	5.02	4.96	5.29	4.10	5.82	4.21	3.81
HT	3.60	4.29	4.10	5.04	5.70	4.90	5.01	3.00	4.10
Mean ±SEM	3.04± 0.2018ns	6.04± 0.2964	4.09± 0.3047^{ns}	5.63± 0.2190^{ns}	4.81± 0.2591^{ns}	4.22± 0.2987^{ns}	5.11± 0.1336^{ns}	4.76± 0.2475***	4.11± 0.07786*

Spleen

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.401	0.222	0.395	0.340	0.342	0.345	0.337	0.338	0.344
B	0.402	0.222	0.395	0.339	0.341	0.344	0.338	0.337	0.343
T	0.403	0.220	0.396	0.338	0.343	0.344	0.339	0.342	0.341
HB	0.404	0.222	0.395	0.342	0.343	0.339	0.338	0.341	0.342
BT	0.401	0.221	0.396	0.341	0.341	0.346	0.340	0.340	0.340
HT	0.404	0.222	0.396	0.341	0.341	0.345	0.341	0.342	0.346
Mean ±SEM	0.404± 0.0005***	0.222± 0.0003	0.396± 0.0002***	0.341± 0.006***	0.343± 0.0004***	0.347± 0.001***	0.339± 0.0006***	0.342± 0.0008***	0.346± 0.0008***

Adrenal gland

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.043	0.034	0.0941	0.0966	0.0954	0.0950	0.0960	0.0949	0.0948
B	0.041	0.034	0.0942	0.0965	0.0952	0.0948	0.0950	0.0950	0.0947
T	0.042	0.035	0.0943	0.0950	0.0953	0.0950	0.0948	0.0952	0.0945
HB	0.043	0.034	0.0940	0.0963	0.0953	0.0950	0.0952	0.0949	0.0949
BT	0.043	0.032	0.0939	0.0962	0.0951	0.0948	0.0955	0.0951	0.0947
HT	0.041	0.034	0.0942	0.0961	0.0953	0.0949	0.0954	0.0952	0.0945
Mean ±SEM	0.041± 0.042^{ns}	0.035± 0.0004	0.0942± 156.8^{ns}	0.0966± 0.0023^{ns}	0.0953± 0.00042^{ns}	0.0950± 0.00040^{ns}	0.0960± 0.00017^{ns}	0.0952± 0.00056^{ns}	0.0949± 0.0004^{ns}

Kidney

SL.no	Control	Stress control	Standard 100 mg/kg	AQERAR 100 mg/kg	AQERAR 200 mg/kg	AQERAR 400 mg/kg	CERAR 100 mg/kg	CERAR 200 mg/kg	CERAR 400 mg/kg
H	0.711	1.022	0.943	0.963	0.953	0.949	0.959	0.952	0.948
B	0.712	1.022	0.942	0.966	0.952	0.948	0.957	0.951	0.947
T	0.711	1.023	0.942	0.962	0.954	0.950	0.959	0.950	0.945
HB	0.709	1.021	0.943	0.961	0.951	0.951	0.960	0.948	0.947
BT	0.710	1.023	0.944	0.965	0.951	0.949	0.958	0.951	0.949
HT	0.711	1.022	0.941	0.964	0.952	0.948	0.957	0.952	0.948
Mean ±SEM	0.711± 0.00025***	1.024 ± 0.00030	0.942± 0.00042***	0.966± 0.00076***	0.953± 0.00015***	0.950± 0.00047***	0.960± 0.0004***	0.952± 0.0006***	0.949± 0.005***

Effect of Roots extracts of *Asparagus racemosus* on Biochemical parameters in Cold restrain stress test in rats (Mean ±SEM)

S.No	Treatment	Dose (mg/Kg)P.O	Blood glucose mg/dl	Triglycerides mg/dl	BUN mg/dl	Cholestrol mg/dl
1	Control	10ml	82.18± 0.7449***	55.86± 0.2357***	26.41± 0.08***	122.36± 0.345***
2	Stress-control	10ml	115.53± 0.9541	96.11± 0.4501	33.37± 0.06015	224.59± 0.1700
3	Standard (*W.somnifera*)	100mg/kg	98.11± 0.6653***	76.67± 0.5396***	29.65± 0.003652***	124.71± 0.2580***
4	AQERAR	100mg/kg	104.47± 0.326***	83.17± 0.3160***	30.24± 0.006009***	126.90± 19.06***
5	AQERAR	200mg/kg	103.34± 0.3654***	82.22± 0.2662***	30.18± 0.002582***	125.95± 0.2800***
6	AQERAR	400mg/kg	101.44± 0.4540***	81.15± 0.3544***	30.15± 0.004216***	125.67± 0.3121***
7	CERAR	100 mg/kg	103.40± 0.4960***	83.38± 0.4682***	30.19± 0.01759***	126.09± 0.3538***
8	CERAR	200 mg/kg	102.26± 0.2734***	79.68± 0.5090***	30.17± 0.004773***	125.57± 0.2061***
9	CERAR	400 mg/ kg	100.65± 0.5045***	78.22± 0.2764***	30.12± 0.004773***	125.00± 0.2319***

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,
AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus*

Effect of Roots extracts of *Asparagus racemosus* on Weight of organs in Cold restrain stress test in rats (Mean ±SEM)

S.NO	Treatment	Dose (mg/kg) P.O.	Liver gm	Spleen gm	Kidney gm	Adrenal gland gm
1	Control	10ml	3.04± 0.2018 ns	0.404± 0.0005***	0.711± 0.0002***	0.014± 0.0004***
2	Stress Control	10ml	6.04± 0.2964	0.222± 0.000341	1.024± 0.00030	0.035± 0.00040
3	Standard (*W. somnifera*)	100mg/kg	4.09± 0.3047^{ns}	0.396± 0.00022***	0.942± 0.00042***	0.026± 156.8^{ns}
4	AQERAR	100mg/kg	5.63± 0.2190^{ns}	0.341± 0.0060***	0.966± 0.00076***	0.031± 0.0023^{ns}
5	AQERAR	200mg/kg	4.81± 0.2591^{ns}	0.343± 0.000401***	0.953± 0.00015***	0.030± 0.00042^{ns}
6	AQERAR	400mg/kg	4.22± 0.2987^{ns}	0.347± 0.00101***	0.950± 0.00047***	0.029± 0.00040^{ns}
7	CERAR	100 mg/kg	5.11± 0.1336^{ns}	0.339± 0.00060***	0.960± 0.00049***	0.032± 0.00017^{ns}
8	CERAR	200 mg/kg	4.76± 0.2475***	0.342± 0.0008***	0.952± 0.00061***	0.028± 0.00056^{ns}
9	CERAR	400 mg/ kg	4.11± 0.07786*	0.346± 0.0008***	0.949± 0.0008***	0.027± 0.0000054^{ns}

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,

AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus*

Effect of Roots extracts of *Asparagus racemosus* on Cell Mediated Immune Response test in rats (Mean ±SEM) (ml)

S.NO	Treatment	Dose (mg/kg)P.O.	Initial Readings		After 24 hrs		% Increase in PAW Volume
			Right leg Ml	Left leg ml	Left leg ml (SHRBC)	Right leg ml (Saline)	
1	Control	10ml	0.40± 0.003*	0.40± 0.003**	1.06± 0.002***	0.41± 0.003*	158.5
2	Stress Control	10ml	0.51± 0.008	0.51± 0.008	0.95± 0.008	0.51± 0.008	86.2
3	Standard (*W.somnifera*)	100mg/kg	0.52± 0.002*	0.52± 0.002*	1.0± 0.003***	0.52± 0.002*	105.7
4	AQERAR	100mg/kg	0.45± 0.002***	0.45± 0.002***	1.05± 0.003***	0.45± 0.002***	133.2
5	AQERAR	200mg/kg	0.44± 0.002**	0.44± 0.002**	1.03± 0.002***	0.46± 0.003**	123.9
6	AQERAR	400mg/kg	0.47± 0.013***	0.47± 0.013***	1.00± 0.020^{ns}	0.47± 0.013***	112.7
7	CERAR	100 mg/kg	0.45± 0.003**	0.45± 0.003**	1.03± 0.002***	0.47± 0.003**	119.1
8	CERAR	200 mg/kg	0.48± 0.013***	0.48± 0.013***	1.02± 0.006**	0.48± 0.013***	112.5
9	CERAR	400 mg/ kg	0.47± 0.014***	0.47± 0.014***	0.98± 0.014***	0.47± 0.0142***	108.5

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,

AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus*

Effect of Roots extracts of *A. racemosus* in Anoxia stress tolerance in mice.

S.No	Treatment	Dose (mg/kg) p.o.	Duration of tolerance time (in min) after treatment (Mean ±SEM)		
			1st Week	2nd Week	3rd Week
1	Control	10ml	25.12±0.5765	28.9±0.3590	31.6±0.5391
2	Standard (*Withania somnifera)*	10ml	80.53±1.749***	83.61±8.728***	85.25±0.4358***
3	AQERAR	100mg/kg	45.29±1.143***	50.03±0.4818***	52.10±0.3344***
4	AQERAR	200mg/kg	46.16±0.2878***	49.09±0.3727***	53.13±0.5433***
5	AQERAR	400mg/kg	51.11±0.2581***	54.11±0.4634***	56.15±0.5401***
6	CERAR	100mg/kg	55.08±0.6816***	57.16±0.3948***	58.10±0.4252***
7	CERAR	200 mg/kg	60.20±0.3728***	63.20±0.3835***	65.08±0.2880***
8	CERAR	200 mg/kg	62.11±0.3868ns	64.11±0.3084***	67.06±0.4160***

n=6, Significant at p<0.05*,0.01** and 0.001***, ns= not significant,
AQERAR- aqueous extract of roots of *Asparagus racemosus*, CERAR- Chloroform extract of roots of *Asparagus racemosus*

CONCLUSION:

The preliminary phytochemical screenings of root extracts of *Asparagus racemosus* reveals the presence of phytoconstituents like alkaloids, glycosides, saponins, carbohydrates, flavonoids, tannins and phenolic compounds, steroids, proteins and amino acids.

In acute toxicity studies LD_{50} (As per OECD guidelines No.420) with both AQERAR and CERAR no motility and abnormal behavior were recorded in mice even at the highest dose tested of 2000 mg/kg, p.o.

The aqueous extract and chloroform extract of *A. racemosus* decreased the elevated biochemical parameters like blood blood glucose, Cholesterol, Triglycerol, blood cell count like, RBC, WBC, DLC, weight of organs like, liver, spleen, adrenal gland, kidney and ulcerogenesis in forced swimming endurance stress model in rats the adaptogenic activity.

The chloroform extract of *Asparagus racemosus* have decreased the inflammation produced by the SHRBC.

The adaptogenic activity of chloroform extract (400mg/kg) of *Asparagus racemosus* is almost comparable to that of standard *Withania. somnifera* (100mg/kg).

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