

Adaptogenic Activity Studies on the Crude Extract of *Polyscias balfouriana* var. Marginata Root and Leaf

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ABSTRACT

It is a well known fact that stress of any nature produces a non specific state in an organism or a state of 'stress syndrome'. The present study is based on the Adaptogenic activity of *Polyscias balfouriana*. Studies based on forced locomotor activity, behavioral despair test, hypothermia test, hypoxia test and anabolic effect were conducted. The leaf extract was found to have better activity than root extract except for the forced locomotor activity.

Keywords: Adaptogenic Activity, *Polyscias Balfouriana*.

INTRODUCTION

Polyscias balfouriana variety Marginata is an ornamental foliage shrub cultivated in gardens. These plants are popularly known in trades and horticulture nurseries as 'aralias'^[1] since they belong to the family *Araliaceae*. The plant is also known as Scutellarium or dinner plate Aralia or Balfour Polyscias. The plant is available through out the warmer parts of India, especially kerala and Tamil Nadu. It is also available in Irotropical Asia, Malaya. It is a native of New Caledonia. The plants coming under the family *Araliaceae* are mainly constituted by triterpenoid saponins. The chemical studies on the saponins and sapogenins revealed that the triterpenoid saponin content in this family play an important role in the pharmacological activity like stimulation of CNS, anti fatigue and enhancement of non-specific resistance. Ginseng (*Panax quinquefolium*) a tropical plant is one of the few commercially important members of this family.^[2] The crude extracts as well as its pure glycoside (panaxoside) is clinically employed for premature ageing and as revitalize.^[3] It has anabolic effect, increases immune response and physical efficiency in athletes.^[4] Hence in the present work ginseng was kept as the standard.

MATERIALS AND METHODS

The plants *Polyscias balfouriana* was collected from Tamil Nadu agricultural University Coimbatore. The complete pharmacological work was explained before the animal ethical committee and the written protocol was submitted.

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After the approval the animal experiments commenced. All chemicals and reagents used in this work were of analytical grade or above. The fresh leaves and roots were extracted for 72 h with 70 % ethanol by hot continuous extraction using soxhlet apparatus. The extracts obtained were concentrated under vacuum distillation below 60°C. They were diluted with water and further extracted with chloroform to remove the lipid materials. The water extracts left behind were extracted with ethyl acetate and then with n-butanol. The n-butanol layers were separated and evaporated to dryness to give the crude saponin extracts. This was designated as NBS extract. In the preliminary chemical tests the NBS extract shows highly positive results for triterpenoids and gave good colour reactions for Salkowsky test and Liebermann burchard test.

Adaptogenic activity

The medicinal substances causing a state of non specifically increased resistance (SNIR) are named as Adaptogens or Athenktropics.^[5] Adaptogens are the substances which help to increase resistance of the body towards noxious influence, including physical, chemical and biological stresses. It was proposed that the adaptogens could restore and maintain physiological homeostasis irrespective of the direction of the physiological perturbation. *Panax ginseng* is a plant adaptogen claimed to be the "elixir of life" in the traditional Chinese system of medicine. There after *Panax ginseng* has been extensively investigated experimentally and clinically. Ginseng has been claimed to have anti-stress, anti-fatigue, mood stabilizing, serenic and cognition-facilitating properties. So this plant appears to exert a combination of effects on CNS, including arousal facilitation of conditioned behavior, augmentation of reflex responses and attenuation of fatigue, particularly under the stress conditions. The root

Table 1: Forced locomotor activity^[7-12]

Animal group	Drug	Dose (mg/kg) Oral	Fall time in seconds		% decree in fall of time in seconds
			Before diazepam administration	After diazepam administration	
Group 1	PBML+diazepam	250mg/kg+5mg/kg	90.5±2.759	50.81±0.3391	28.11%±0.567
Group 2	PBML+diazepam	500mg/kg+10mg/kg	92.6±0.09685	54.83±2.0479	35.64%±1.261
Group 3	PBMR+diazepam	250mg/kg+5mg/kg	95.23±2.772	56.66±2.321	42.86%±1.8312
Group 4	PBMR+diazepam	500mg/kg+10mg/kg	97.84±2.6838	53.36±2.4058	34.54%±2.7312
Group 5	ginseng+diazepam	250mg/kg+5mg/kg	97.84±2.6838	53.36±2.4058	34.54%±2.7312
Group 6	ginseng+diazepam	500mg/kg+10mg/kg	101.16±1.602	70.83±1.7448	78.59%±1.1812
Group 7	1%CMC	2ml	80.83±3.005	47.33±3.0276	19.33%±3.160

TableNo.2: Behavioral despair test by swim stress induced immobility^[7-12]

Animal group	Drug	Dose mg/kg oral	Duration of immobility in seconds
Group1	PBML	250mg/kg	191.16 ±12.0196
Group2	PBML	500mg/kg	211.66±11.5132
Group3	PBMR	250mg/kg	185.33±6.0736
Group4	PBMR	500mg/kg	192.67±11.1005
Group5	Ginseng	250mg/kg	190.0±7.7028
Group6	Ginseng	500mg/kg	256.83±6.9223
Group7	1%CMC	2ml	181.5±7.13326

Table No.3: Hypothermia test^[11-12]

Animal group	Drug	Dose mg/kg Oral	Normal rectal temperature	Rectal temperature after 5 hrs of swimming	Rectal temperature after 30 min after the swimming session
Group1	PBML	250mg/kg	36.4±0.0632	31.5±0.894	33.8±0.894
Group2	PBML	500mg/kg	36.5±0.0894	31.4±0.0195	33.7±0.17788
Group3	PBMR	250mg/kg	36.6±0.0894	31.4±0.0894	33.8±0.1095
Group4	PBMR	500mg/kg	36.4±0.0632	31.6±0.0632	33.6±0.0894
Group5	1%CMC	2ml	36.5±0.0632	31.3±0.1264	33.3±0.1673

Table No.4: Hypoxia test

Animal group	Drug	Dose (mg/kg) oral	Survival time in min
Group1	PBML	250mg/kg	26.71±1.285
Group2	PBML	500mg/kg	39.23±0.956
Group3	PBMR	250mg/kg	35.99±1.031
Group4	PBMR	500mg/kg	37.15±1.433
Group5	Ginseng	250mg/kg	38.81±1.36
Group6	Ginseng	500mg/kg	44.13±1.499
Group7	1%CMC	2ml	30.34±1.287

Table No.5: Anabolic effect^[7-12]

Animal group	Drug	Dose (mg/kg) oral	Initial wt of animal (gm)	Wt of animals after 4 weeks (gm)	Difference in wt after 4 weeks
Group1	PBML	250mg/kg	75.59±1.6945	95.63±1.4511	20.04±2.4808
Group2	PBML	500mg/kg	71.09±2.5494	93.97±2.6047	22.88±2.8124
Group3	PBMR	250mg/kg	73.91±0.7447	93.42±2.4280	19.51±3.0781
Group4	PBMR	500mg/kg	72.37±2.6046	93.68±2.4280	21.31±3.2101
Group5	1%CMC	2ml	74.09±5.3512	92.79±4.2652	18.7±4.8216

powder of ginseng was used as a standard for the Adaptogenic activity studies of the leaves and roots of *Polyscias Balfouriana*.

The acute toxicity studies of the NBS extracts of the root and the leaf were performed by the method of Smith^[6] and it was proved that the extracts were non toxic and safe up to a dose of 2.5 g/Kg body weight.

RESULTS AND DISCUSSION

The effect of different doses of NBS extracts of the leaves and roots of *Polyscias balfouriana* and root powder of white Panax ginseng on the muscle grip strength of mice treated with drug diazepam by using Rota rod apparatus was studied and observed that both *Polyscias balfouriana* and *Panax Ginseng* possess anti-depressant and anti-stress activity. The root extract at a dose of 500 mg/kg body wt showed better anti-depressant and anti-stress activity when compared to the either doses of leaf and root extracts of *Polyscias balfouriana*. The effect of different doses of NBS extracts of leaves and roots of *Polyscias balfouriana* and root powder of white Panax ginseng on swim stress induced immobility in

mice was studied and confirmed that both *Polyscias balfouriana* and *Panax Ginseng* possess anti-stress activity. The leaf extract at a dose of 500 mg/kg body weight showed better anti-stress activity when compared to other doses of root and leaf extracts of *Polyscias balfouriana*. The effect of NBS extracts of leaf and root of *Polyscias balfouriana* at different doses on the hypothermia in mice was studied and confirmed that the drug showed anti-stress activity and complementary changes in hypothermia. The leaf extract at 500 mg/kg showed better anti-stress activity when compared to other extracts. The effect of NBS extracts of leaf and root of *Polyscias balfouriana* and root powder of white Panax ginseng on hypoxia test in mice were studied and confirmed that different doses of *Polyscias balfouriana* and *Panax ginseng* possess anti-stress activity. The leaf extract at 500 mg/kg showed better anti-stress activity than other doses of root and leaf extract. The NBS extracts of root and leaf at different doses were studied and confirmed that the leaf extract at a dose of 500 mg/kg showed better anabolic effect. Adaptogenic activity studies of the NBS extract of leaves and root of *Polyscias balfouriana* were carried out by observing a

set of experiments like forced locomotor, behavioral despair test by swim stress induced immobility, hypothermia test, hypoxia test, anabolic effect. The leaf extract showed at 500 mg/kg body weight comparable Adaptogenic activity as that of white Panax ginseng root extract wherever it was kept as the standard. In case of forced locomotor activity the root extract at a dose of 500mg/kg body weight showed better activity. The present study confirms that the root and leaf extracts of *Polyscias balfouriana* increases the resistance of organisms by inducing a state of non-specifically increased resistance, irrespective of the nature of the stress. Reactivity is the basic feature of living system and ageing is closely related to changes in reactivity and adaptation capacity resulting from a progressive decrease in self regulatory mechanisms. The crude extract of *Polyscias balfouriana* can be employed clinically for premature ageing and as a revitalizer.

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