BIOCHEMICAL EFFECT OF INDUCED SUB ACUTE TOXICITY OF *PARTHENIUM HYSTEROPHORUS* L. AND ITS AMELIORATION WITH *PROSOPIS CINERARIA* (L.) DRUCE LEAVES IN WISTAR ALBINO RATS

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ABSTRACT

An ameliorative effect of *Prosopis cineraria* leaves on biochemical parameters against induced sub acute toxicity of *Parthenium hysterophorus* L. in Wistar albino rats was studied. A total of eighty clinically healthy adult albino rats between 2 and 3 months of age of either sex were divided in eight experimental groups each comprising of ten rats. Parthenium toxicity was induced by oral feeding of ethanolic extract of *Parthenium* at 150, 300 and 450 mg/kg body weight in group II, III and IV, respectively for 28 days. Group V, VI and VII were fed with ethanolic extract of *Parthenium* at 150, 300 and 450 mg/kg body along with 200 mg/kg body weight of methanolic extract of leaves of *Prosopis cineraria*. Group I served as control while group VIII was kept as treatment control and fed only methanolic extract of leaves of *Prosopis cineraria* at 200 mg/kg body weight. The treated rats showed a significant ($P \leq 0.05$) increase in alanine aminotransferase (ALT), aspartate transaminase (AST), alkaline phosphate (ALP), serum creatinine and serum urea level receiving the different dose of parthenium which indicated a deleterious effect of parthenium on liver cells. Significant reduction of serum total protein was observed in group II, III and IV. *Prosopis cineraria* could restore the above in group treated with *Parthenium* at low dose level.

Key words: Parthenium toxicity, *Prosopis cineraria*, Wistar albino rats

Introduction

Parthenium hysterophorus L. was accounted to be one of the seven most dangerous weed of the world. It is an aromatic annual and obnoxious invasive herb under Asteraceae family, commonly known as congress grass, chatak chandani, gazar ghas, dog flea weed and white heads (Rao, 1956; Vertak, 1968; Maiti, 1983; Adkins *et al*., 1996; Ramaswami, 1997). The toxic chemical in plant parts contains sesquiterpene lactones. The major components of toxin being 'Parthenin' and other phenolic acids such as caffeic acid, vanillic acid, anisic acid, chlorogenic acid, parahydroxy-m-benzoic acid and p-anisic acid which are lethal to human beings and animals (Picman *et al*., 1982; Narsimhan *et al*., 1984; Sharma and Kaur, 1989; Bezuneh, 2015). *Parthenium* is poisonous to livestock if it is consumed or repeatedly in contact with the weed. Those animals can face-off death, rashes on their body and udders, alopecia, loss of skin pigmentation, allergic skin reactions, dermatitis, diarrhoea, anorexia and pruritus. *Parthenium* may affect the psychological behaviour of animals. During scarceness of fodder cattle, sheep and goats are forced to eat *Parthenium* which can taint their meat and make dairy milk unpalatable due to its irritating odour (Narsimhan *et al*., 1977; Tudor *et al*., 1982; Ahmed *et al*., 1988). When human beings often come in contact with this weed, it may cause allergy, dermatitis, eczema, black spots and blisters around eyes, burning rings and blisters over skin, redness of skin and asthma etc. (Lonker *et al*., 1974; Subba Rao *et al*., 1976; Verma *et al*., 2001; Handa *et al*., 2001). *Prosopis cineraria* (L.) Druce {Khejri} is a state tree of Rajasthan has been traditionally used by the rural community for treatment of various ailments such as helminthiasis, leprosy, dysentery, bronchitis, asthma, leucoderma, piles, tremours of the muscles and wandering of the mind. Its leaves are fodder for camels, goats and donkeys. Leaf paste of plant is applied on boils and blisters, including mouth ulcers in livestock and leaf infusion on open sores on the skin (Kirtikar and Basu, 1984; Nandkarni, 2000; Khatri *et al*., 2010, 2011). The present work is designed to study the biochemical changes during sub acute toxicity of *Parthenium hysterophorus* L. in Wistar albino rats and the protective property of *Prosopis cineraria* (L.) Druce during parthenium toxicity.

Materials and Methods

A total of 80 rats will be randomly divided into 8 groups (Group I, II, III, IV, V, VI, VII and VIII). Group-I (n = 10) served as control in which 1% Tween 80 suspension (vehicle) was administered. Treatment group II was administered ethanolic extract of *Parthenium* @ 150 mg/kg b.wt, group III received ethanolic extract of *Parthenium* @ 300 mg/kg b.wt, group IV was administered ethanolic extract of *Parthenium* @ 450 mg/kg b.wt., group V was given ethanolic extract of *Parthenium* + methanolic extract of *Prosopis* @ 150 mg/kg b.wt and 200 mg/kg b.wt., respectively, group VI was given ethanolic extract of *Parthenium* + methanolic extract of *Prosopis* @ 300 mg/kg b.wt and 200 mg/kg b.wt, respectively and group VII was given ethanolic extract of *Parthenium* + methanolic extract of *Prosopis* @ 450 mg/kg b.wt., and 200 mg/kg b.wt and group VIII served as treatment control and fed only methanolic extract of *Prosopis* 200 mg/kg b.wt orally by gavage. The oral LD_{50} of ethanolic

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extract of *Parthenium hysterophorus* against rats was found to be 676.64 mg/kg body weight (Maurya and Kushwaha, 2010). The animals were kept in polypropylene cages and acclimatized for one week prior to the experiment to alleviate any non- specific stress, in the experimental lab under standard managemental conditions [at a temperature of 25°C (± 5°C), with natural 12 hours light/12 hours dark cycle]. Standard rat feed and water provided *ad libitum* throughout the experimental period. The necessary Institute Animal Ethical Committee approval was obtained. Collection of plant *Parthenium* was done from the surrounding area of CVAS Navania, Udaipur and *Prosopis* was collected from desert area of Shekhawati region (Rajasthan). Authentication (Identification) of plant materials was done from Botanical Survey of India, Jodhpur (Rajasthan). Five hundred grams of dried aerial parts of the plant *Parthenium hysterophorus* and two hundred and fifty grams of dried leaves of the plant *Prosopis cineraria* was grinded into fine powder and subjected to soxhlet extraction with ethanol for *Parthenium* and methanol for *Prosopis* for twelve hours and evaporated by using rotary vacuum evaporator. Blood samples was collected in tubes, centrifuged at 2,500 rpm for 15 min and the serum separated and stored at -20°C for analysis. Serum samples was analyzed for determination of alanine aminotransferase (ALT) or glutamic pyruvic transaminase (SGPT), aspartate transaminase (AST) or serum glutamic oxaloacetic transaminase (SGOT), alkaline phosphate (ALP), serum creatinine, serum urea and total protein.

Results and Discussion

The effect of oral administration of ethanolic extract of *Parthenium* and methanolic extract of *Prosopis* on biochemical parameters are shown in Table 1. The treated rats showed a significant ($P \leq 0.05$) increase in alanine aminotransferase (ALT) or serum glutamic pyruvic transaminase (SGPT), aspartate transaminase (AST) or serum glutamic oxaloacetic transaminase (SGOT), alkaline phosphate (ALP), serum creatinine and serum urea receiving the different dose of *Parthenium*. Total protein showed significant decrease in II, III and IV group as compared to control where as group V, VI and VII receiving prosopis showed counteract untoward effect of *Parthenium*. Group VIII receiving methanolic extract of *Prosopis* remained normal throughout the period of experiment. *Prosopis cineraria* supplementation indicated protective role of plant at low dose toxicity in the rats.

Plasma levels of urea and creatinine are useful biomarkers of renal function in human and animal studies. An increase levels in the plasma is an indication of the loss of renal function (Olayinka and Ore, 2015). Similarly *Parthenium* intoxication elevates the liver enzymes, including ALT, AST and ALP, may be due to production of reactive oxygen species, which may enhance lipid peroxidation and toxic aldehydes which induce inflammation and necrosis in the liver (Aydin, 2011; Duzguner and Erdogan, 2012). Total protein level reflects major functional changes in kidney and liver functions. A significant decrease ($P \leq 0.05$) in serum total protein was observed in this study. Toxicity or damage to the liver may result in decreased levels of total protein in blood (Kaneko *et al*., 1997). A significant ($p<0.05$) improvement in total protein levels and reduction in urea, creatinine, ALT, AST and ALP level after methanolic extract of *Prosopis cineraria* supplementation may be due to its antioxidant property which can reduce the free radical-mediated oxidative stress (Dharani *et al*., 2011; Bangaruswamy *et al*., 2015).

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Table 1: Effect on biochemical parameters in rats after 28 days oral administration of different dose of ethanolic extract of parthenium and its amelioration with methanolic extract of prosopis

Groups	Biochemical parameters					
	ALT/SGPT (IU/L)	AST/SGOT (IU/L)	ALP (IU/L)	Serum Creatinine (mg/dl)	Serum urea (mg/dl)	Total protein (g/dl)
I	46.09 ± 1.32^{e}	152.18 ± 2.36^{e}	61.48 ± 1.36^{e}	0.63 ± 0.01^{e}	34.35 ± 0.51^{d}	8.15 ± 0.11^{a}
II	58.32 ± 1.10^{c}	179.88 ± 1.66^{c}	87.51 ± 0.90^{c}	0.79 ± 0.01^{c}	43.39 ± 0.81^{c}	7.05 ± 0.09^{c}
III	69.77 ± 0.74^{b}	202.59 ± 2.61^{b}	99.91 ± 2.13^{b}	0.92 ± 0.01^{b}	52.02 ± 1.24^{b}	6.41 ± 0.11^{d}
IV	78.46 ± 0.93^{a}	247.06 ± 3.39^{a}	133.75 ± 2.09^{a}	1.08 ± 0.02^{a}	65.99 ± 1.63^{a}	5.46 ± 0.11^{e}
V	52.22 ± 0.96^{d}	166.91 ± 2.36^{d}	75.97 ± 0.80^{d}	0.72 ± 0.01^{d}	39.56 ± 0.39^{c}	7.68 ± 0.10^{b}
VI	65.76 ± 0.97^{b}	194.07 ± 1.40^{b}	90.03 ± 1.06^{c}	0.88 ± 0.01^{c}	50.18 ± 0.97^{b}	6.74 ± 0.08^{cd}
VII	76.29 ± 1.16^{a}	241.58 ± 1.64^{a}	127.57 ± 1.09^{a}	1.06 ± 0.02^{a}	65.12 ± 1.52^{a}	5.62 ± 0.05^{e}
VIII	45.76 ± 1.40^{e}	151.88 ± 2.58^{e}	61.08 ± 1.08^{e}	0.63 ± 0.01^{e}	34.09 ± 0.61^{d}	8.21 ± 0.09^{a}

All values are represent Mean ± SEM; n=10 in each group; values bearing different superscript in the same column differ significantly between groups at $P \leq 0.05$ in Tukey's multiple comparison post hoc test

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