Evaluation of antipyretic activity of some medicinal plants from Cholistan desert Pakistan

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Abstract: Traditional herbal healers "Hakims" use various plants of the Cholistan desert, Pakistan for treating a number of infectious and non-infectious diseases. However, there has never been a scientific validation of these plant-based therapeutics. We compared the antipyretic effect of *Echinops echinatus, Alhagi maurorum, Fagonia cretica, Cymbopogon jwarancusa* and *Panicum turgidum* in animal model. These plants were used to reduce *E.coli* lysate induced pyrexia in rabbits. There were five groups of rabbits having five rabbits in each group. Among these five groups, three received various doses of experimental treatment, paracetamol was given to fourth group known as positive control. The fifth group of animals served as negative control and received no treatment. Ethanol extracts of *Fagonia cretica* (500mg/kg), *Panicum turgidum* (500mg/kg and 750mg/kg), *Alhagi maurorum* (500 and 750mg/kg), *Cymbopogon jwarancusa* (250mg/kg) and *Echinops echinatus* (750mg/kg) showed significant antipyretic effects when compared with controls and experimental counterparts. These results revealed that ethanol extracts of the plants evaluated in this study have dose dependent antipyretic activity. Further detailed screening of these plant species is recommended.

Keywords: *Escherichia coli,* Cholistan desert, analgesic, anti-inflammatory, prostaglandin, *E. coli* induced pyrexia, traditional medicine.

INTRODUCTION

The Cholistan Desert, occupying an area of 26000 km^2 is situated in south-west of Punjab province of Pakistan (Arshad *et al.,* 2008). This sandy desert is endowed with 138 plant species including 64 medicinal plants (Arshad *et al.,* 2007), which are extensively used by the traditional herbal practitioners (Hakims) and local people for the treatment of different infectious and non-infectious diseases (Arshad *et al.,* 2003). This area is isolated from the modern amenities and inhabitants have traditionally utilized several plant species of this region for fulfilling their healthcare needs. Data regarding ethno-botanical or ethno-pharmacologically characteristics of this region plants is almost non-existent except very few reports from our group (Arshad *et al.,* 2003).

Some worth mentioning medicinal plants of this sandy desert are *Fagonia cretica, Corchorus depressus, Capparis decidua, Citrullus colocynthis, Calotropis procera, Echinops echinatus, Alhagi maurorum, Cymbopogon jwarancusa* and *Panicum turgidum.*

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Cymbopogon jwarancusa (Khavi) is an aromatic perennial grass and belongs to family Poaceae. Local people and herbal practitioners use this plant for the treatment of burning sensation, cough, cholera, vomiting, thirst, unconsciousness, fever, swellings, blood and skin diseases (Arshad *et al.,* 2003). *Panicum turgidum* (Murrot) is a drought hardy perennial grass of Cholistan desert and belongs to family poaceae. It is commonly used by the local people for the disinfection in small pox (Arshad *et al.,* 2003, Kirtikar & Basu, 1991). *Echinops echinatus* (Unt-Kantalo) belongs to family compositae and extensively used to increase the appetite, to stimulate liver and to cure the chronic fever (Arshad *et al.,* 2003). The plant is also used as stomachic, antipyretic, analgesic, appetizer and abortifacient (Kirtikar & Basu, 1991, Parrotta, 2001).

Alhagi maurorum (Jawahan) belongs to family Papilionaceae is a common weed plant in the agricultural land along with the periphery of Cholistan desert. *Alhagi maurorum* is prescribed in cough, bronchitis, piles and skin diseases (Arshad *et al.,* 2003). *Fagonia cretica* (Dhman/Dhmasa) is a common plant of Cholistan desert and belongs to family Zygophyllaceae. It grows in the

compact clayey soil of the area. This is prescribed in peptic ulcer, pyrexia, enteric fever and snake bite (Arshad *et al.,* 2003). The plant is diuretic, styptic, antipyretic, analgesic, anti dysenteric, antidote stomachic, blood purifier, antihepatotoxic, antiemetic, anti-tussive, astringent, antiseptic, tonic, stimulant, alterative, anti-tumor, antiasthmactic, emmenagogue AN antibilious (Kirtikar & Basu, 1991).

There is no scientific information available to validate the claim of traditional herbal practitioners (Hakims) and local people of Cholistan desert about the effectiveness of these plants. To validate claim of traditional healer about its efficacy in pyrexia, study was conducted to investigate the efficacy of *Echinops echinatus, Alhagi maurorum, Fagonia cretica, Cymbopogon jwarancusa* and *Panicum turgidum* on *E.coli* induced pyrexia in rabbits.

MATERIALS AND METHODS

Plants collection

For the evaluation of antipyretic activity, five plant species were selected (table 1). Plant samples (aerial parts) were collected in March 2007 from the Cholistan Desert of Pakistan and identified by the plant taxonomist, Dr. Muhammad Arshad.

Preparation of extracts

Plant samples washed carefully with distilled water and dried in open air under shade. Fine powered of dried plant material was prepared. To prepare ethanol extract, 500 g plant powder was soaked in 3 liter ethanol. After one week, filtrate was obtained and rotary evaporator was used for evaporation of filtrate. Process of evaporation was continued till complete evaporation of men strum was ensured.

Animals

Present investigation was conducted on healthy adult rabbits weighing 1100-1200 grams. Standard environmental conditions having temperature $22\pm3^{o}C$ were kept for animals and standard diet was provided.

Preparation of E. coli suspension

The pure culture of *Escherichia coli (E. coli)* was obtained and incubated at $37^{o}C$ for 24 hours. The colonies were counted and one colony was picked, washed in normal saline and re-cultured on agar-plate and incubated for 24 hours. Again one colony was picked and re-cultured on nutrient broth and incubated for 24 hours. A ten-fold dilution of the suspended broth culture was prepared with normal saline and total number of *E. coli* in one ml volume was maintained as 127×10^{7} (Riffat *et al.,* 1982).

Antipyretic activity

Fever in rabbits under investigation was produced by injecting the *E. coli* suspension, in the marginal ear vein of the rabbits at the concentration of 0.01ml per kg body weight (Riffat *et al.,* 1982). There were total twenty-five rabbits with five groups. Each group has five rabbits. Extracts were given orally as follows:

Group 1:Negative control: Only vehicle (*E. coli* suspension 0.01 ml/kg).
Group 2:Positive control: Paracetamol (150mg/kg).
Group 3:Treatment group 1:Plant extract (250mg/kg).
Group 4:Treatment group 2:Plant extract (500mg/kg).
Group 5:Treatment group 3:Plant extract (750mg/kg).

RESULTS

As compared to positive and negative control groups dose dependent antipyretic effect was recorded by different doses of alcohol extracts of *Echinops echinatus, Alhagi maurorum, Fagonia cretica, Cymbopogon jwarancusa* and *Panicum turgidum.* The alcoholic extract of *Echinops echinatus* decreased temperature at 750mg/kg dose that persisted for 3 hours (table 2). The dose rate of 250mg/kg decreased temperature after two hours of drug administration and maintained it for 2 hours. Significant reduction in rectal temperature was observed at 750mg/kg for longer period as compared to positive and negative control group of experimental animals.

The extract of *Fagonia cretica* revealed that all the doses (250, 500 and 750mg/kg) were effective in decreasing temperature (table 3). As compared to positive and negative control groups, *Fagonia cretica* (750mg/kg) appeared as very effective in controlling the rectal temperature of rabbits for 3 hours. The dose rate of 500 and 250mg/kg also exhibited significant reduction in temperature.

Alcoholic extract of *Alhagi maurorum* also proved effective to control fever in experimental animals (table 4). Maximum reduction in rectal temperature of the animals was recorded by the dose rate of 500mg/kg and 750mg/kg. As compared to positive and negative control groups, the dose rates of 500mg/kg and 750mg/kg were better in decreasing the pyrexia in animals.

The extracts of *Cymbopogon jwarancusa* showed very uncertain results (table 5). Dose rate of 250mg/kg showed maximum decrease in rectal temperature of animals, which persisted for only two hours. In dose rate of 500mg/kg and 750mg/kg there was a decrease in rectal temperature of animals but was not persisted for more than one hour.

The alcoholic extract of *Panicum turgidum* showed that at hour one, maximum decrease in rectal temperature of animals was recorded by treatment dose of 750mg/kg and 250mg/kg (table 6). At hour 3, 4 and 5 maximum decrease in temperature was noted by treatment dose of 750mg/kg followed by treatment 250mg/kg and 500

Table 1: Detail of plant samples collected

Botanical Name	Local name	Family	Parts sampled
Echinops echinatus	Unt-kantalo	Compositae	Stem and leaves
Alhagi maurorum	Jawnhan	Papilionaceae	Stem and leaves
Fagonia cretica	Dhman/Dhmasa	Zygophyllaceae	Stem and leaves
Cymbopogon jwarancusa	Khavi	Poaceae	Stem and leaves
Panicum turgidum	Murrot	Poaceae	Stem and leaves

Table 2: Antipyretic activity of ethanol extracts of *Echinops echinatus*

Treatment	Doses/kg	Rectal Temperature ^{o}F					
		Injecting *E. coli* Suspension	Drug administration	After Drug			
		0 h	1 h	2 h	3 h	4 h	5 h
Control		100± 0.251	103.2± 0.351	103.6 ±0.301	104± 0.205	103.9± 0.306	104.3± 0.607
Extract	250mg	100.7± 0.306	102.6± 0.402	101.4 ±145*	101.5± 0.405*	102.3± 0.26*	103± 0.251*
	500mg	100.4± 0.540	104± 0.203	102.2 ±0.506*	101.8± 0.200*	102.9± 0.202*	103.6± 0.416*
	750mg	99.6± 0.643	103.7± 0.317	101.4± 0.600*	101.3± 0.033*	102.4± 0.033*	102.2± 0.203*
Paracetamol	150mg	100.5± 0.102	103.8± 0.208	101± 0.417*	101.6± 0.230*	102.9± 0.000*	103.1± 0.203*

Table 3: Antipyretic activity of ethanol extract of *Fagonia cretica*

Treatment	Doses/kg	Rectal Temperature ^{o}F					
		Injecting *E. coli* Suspension	Drug administration	After Drug			
		0h	1h	2h	3h	4h	5h
Control		100± 0.302	102.3± 0 .218	1.2.8± 0.100	103.1± 0.100	103.1± 0.100	103.5± 0.300
Extract	250mg	100.3± 0.202	102.8± 0.205	101.3± 0.602*	101.7± 0.401*	101.7± 0.371	103.2± 0.145
	500mg	99.8± 0.635	103.3± 0.205	100.9± 0.806*	101.4± 0.185*	101.4± 0.185	103.2± 0.366
	750mg	99.4± 1.28	103.2± 0.300	101.5± 0.500*	101.6± 0.206*	101.6± 0.206	103± 0.120
Paracetamol	150mg	100.2± 0.500	103.3± 0.260	101.5± 0.500*	101.6± 0.206	101.6± 0.206	103± 0.120

Mean ± SEM * P<0.05

mg/kg. Overall treatment dose of 750mg/kg appeared as the best dose to control rectal temperature of animals, which persisted for four hours.

DISCUSSION

In present study antipyretic activity of alcoholic extract of *Echinops echinatus, Fagonia cretica, Cymbopogon jwarancusa, Panicum turgidum* and *Alhagi maurorum* was investigated in *E.coli* induced pyrexia in rabbits. The results showed that dose rate of 250mg/kg of alcoholic extract of *C. jwarancusa* appeared as the best dose for the reduction of rectal temperature of animals. In case of *Panicum turgidum* the dose rate of 750mg/kg and 250 mg/kg were effective in decreasing *E. coli* induced pyrexia in rabbits, whereas the extracts of *Echinops echinatus* and *Fagonia cretica* at the dose rate of 750 mg/kg appeared as the best one for the controlling of the animal temperature. The dose rate of 500 and 750mg/kg of ethanol extract of *Alhagi maurorum* were very effective to control animal temperature.

In general, certain endogenous substances such as prostaglandins are considered to produce fever (Kluger, 1991; Roth & Zeisberger, 1995). Antipyretic drugs have ability to inhibit formation of prostaglandins (Vane, 1987). Therefore, the antipyretic action of alcoholic extracts of *Echinops echinatus, Fagonia cretica, Cymbopogon jwarancusa, Panicum turgidum* and *Alhagi maurorum* may be due to prostaglandin inhibition. Results

Table 4: Antipyretic activity of ethanol extract of *Alhagi maurorum*

Treatment	Doses/kg	Rectal Temperature °F					
		Injecting *E. coli* Suspension	Drug administration	After Drug			
		0 h	1 h	2 h	3 h	4 h	5 h
Control		100.5± 0.240	102.9± 0523	103.2± 0375	103.5± 0348	104.2± 0.546	104.3± 0.491
Extract	250mg	101± 0.491	103.6± 0.233	102± 0.173*	102.4± 0.100*	102.9± 0.231*	103.7± 0.265
	500mg	100.5± 0.984	103.4± 0.440	101.8± 0.088*	102.1± 0.523*	102.9± 0231*	104.1± 0.233
	750mg	100.1± 0.592	103± 0.066	101.7± 0.305*	101.9± 0.378*	103.1± 0.393	103.6± 0.333
Paracetamol	150mg	100.9± 0.519	103.3± 0.088	101.3± 0.166*	102.3± 0.881*	102.9± 0.033*	103.6± 0.208

Table 5: Antipyretic activity of ethanol extract of *Cymbopogon jwarancusa*

Treatment	Doses/kg	Rectal Temperature °F					
		Injecting *E. coli* Suspension	Drug administration	After Drug			
		0 h	1 h	2 h	3 h	4 h	5 h
Control		100.4± 0.346	103± 0.115	103.2± 0.206	103.5± 0.233	103.7± 0.622	104.3± 0.417
Extract	250mg	100.3± 0.458	103.5± 0.401	101.8± 0.833*	101.9± 0.504*	102.3± 0.548*	103.2± 0.50*
	500mg	100.6± 0.657	103.3± 0.437	101.9± 0.306*	101.8± 0.115*	102.9± 0.145	103.2± 0.13*
	750mg	100.4± 0.176	103.3± 0.437	101.7± 0.203*	101.4± 0.264*	102.7± 0.145	103.1± 0.145
Paracetamol	150mg	100.2± 0.203	102.7± 0.088	102± 0.224*	101.3± 0.709*	102.3± 0.305*	103.5± 0.120*

Table 6: Antipyretic activity of ethanol extract of *Panicum turgidum*

Treatment	Doses/kg	Rectal Temperature °F					
		Injecting *E. coli* suspension	Drug administration	After Drug			
		0h	1h	2h	3h	4h	5h
Control		101± 0.451	102.3 ±0.90	104± 0.252	104.3± 0.20.8	104.4± 0.30	104.9± 0.033
Extract	250mg	99.9± 0.857	102.8± 0.825	102.5± 0.30 *	102.9± 0.433*	103.2± 0.433*	103.7± 0.433
	500mg	99.9± 0.657	103.4 ±0.30	102.1± 0.20 *	101.7± 0.635*	103.1± 0.30*	103.6± 0.333
	750mg	100.5± 0.60	103.5± 0.318	101.6± 0.231*	102.1± 0.203*	102.9± 0.318*	103.6± 0.448
Paracetamol	150mg	100.3± 0.251	103.7 ±0.40	101.2± 0.033*	101.2± 0.410*	102.7± 0.210*	103.8 ±0.20

Mean ± SEM * P<0.0 5

of present study correspond with the findings of Hukkeri *et al.,* (2006); Reanmongkol *et al.,* (2006) and Lakshman *et al.,* (2006). The findings of present investigation are also in conformity with the results of Olajide *et al.,* (2000), Chattopdyhyay *et al.,* (2002) and Arul *et al.,* (2005).

CONCLUSION

The results achieved in the present study depicted that the alcoholic extracts of *Echinops echinatus, Fagonia cretica, Cymbopogon jwarancusa, Panicum turgidum* and *Alhagi maurorum* possess dose dependent antipyretic activity. The results affirmed the claim by the herbal practitioners of the area, which use this plant to cure fever in humans. However, further studies are required to explore the exact mechanism of action of Plants extracts.

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