

# Hydro-alcoholic Extracts of *Fagonia indica* Burm. f. Contribute Anti-pyrexia Activity to *E. coli* Exposure in Rabbits

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**Abstract:** Folk herbal practitioners of the Cholistan desert claim antipyretic activity in *Fagonia indica* Burm. f.. To validate the claim of local herbal practitioners, hydroalcoholic extract of aerial parts of *Fagonia* were orally tested at 25mg/kg, 50mg/kg and 100mg/kg of body weight for antipyretic effect in *E.coli* induced pyrexia in rabbits. As compared to the negative and positive control groups the dose rate 100mg/kg showed high antipyretic activity followed by the dose of 50mg/kg and 25mg/kg body weight. The results of present study leads to conclude that the hydro-alcoholic extract of *Fagonia cretica* have significant antipyretic activity. These results also affirm the claim by the local herbal practitioners of the region which use this plant to cure fever in humans.

**Keywords:** Cholistan Desert, *Fagonia indica*, *Escherichia coli*, induced pyrexia, antipyretic, prostaglandin.

## 1. Introduction

Medicinal plants are used against various diseases since thousands of years. For example liquorices are used for sore throat and anti-tussive. The nature is the source of number of medicinal plant wealth for humanity, which has therapeutic activity. There is dire need to explore their medicinal activity and to conduct pharmacodynamic and pharmacokinetic studies to confirm their medicinal effects [1].

*Fagonia indica* Burm. f., is medicinal plants of Cholistan Desert was selected to address the pyrexia. *Fagonia indica* locally known as "Dahmasa" belonging to the family Zygophyllaceae is a much branched spiny herb commonly used by the local people to cure inflammation, as analgesic, arthritis, liver disorders with symptoms of anorexia, mental fatigue, constipation and jaundice [2,3]. *F. indica* has hepatoprotective properties [4]. *F. indica* is bitter in taste and is used for the treatment of fever, thirst, vomiting, dysentery asthma, urinary discharges, liver trouble, typhoid, toothache, stomach troubles and skin diseases [5].

## 2. Materials and Methods

### 2.1 Plant material

Aerial parts of *Fagonia indica* was collected in March, 2007 from Cholistan desert and were identified and confirmed by the plant Taxonomist Dr. Muhammad Arshad Deputy Director, at the Cholistan institute of Desert Studies, The Islamia University of Bahawalpur, Pakistan.

### 2.2 Preparation of hydro-alcoholic plant extract

The hydro-alcoholic plant extract were prepared by modified method of, the plant material one part and solvent nine parts was used for preparation of plant extract [6]. The solvent used was ethanol and distilled water (70% alcohol and 30% water). Hundred grams powder of each selected plant was soaked in 900 ml of solvent (Ethanol 600 ml + Distilled water 300 ml), in a conical flask having capacity of 2 liter. The material was soaked for one week and shaken vigorously for ten minutes twice a day. The flask was kept in laboratory on room temperature (20 °C). Finally the soaked material of each plant was filtered through several layers of muslin cloth one by one for coarse filtration. The coarse filtrate was filtered through a Whatman # 3 filter paper. The filtrate tinctures were kept in close neck plastic bottles with tight closure on (20 °C) temperature.

### 2.3 Preparation of hydro-alcoholic of paracetamol

Fifteen grams powder of paracetamol was soaked in 150 ml of solvent (Ethanol 105 ml + Distilled water 45 ml), for twenty minutes. The container was closely tightened with aluminum sheet for prevention of unwanted evaporation of solvent. The container was kept in laboratory on room temperature (20 °C).

### 2.4 Procurement of Animals

Healthy male and female adult rabbits of local strain (*Oryctolagus cuniculus*) weighing 1000-1200 grams were purchased from local market for the evaluation of antipyretic activity. The animals were acclimatized in an environment of controlled temperature 22-25 °C and light/dark 12h/12h cycle

for one week prior to study. Food and water were withdrawn from all the experimental animals for one hour before drug treatment. Food and water was continued just after the administration of drug.

## 2.5 Management of Animals

All the rabbits were kept in air conditioned animal house located in the College of Conventional Medicine the Islamia University of Bahawalpur. These animals were given grass, bread, maize, wheat grains and water. The experiments were started after one week of acclimation of animals.

## 2.6 Preparation of *E.coli* Suspension

The pure and identified cultures of *Escherichia coli* (*E.coli*) were obtained on MacConkeys agar from microbiology laboratory of Quid-e-Azam Medical College Bahawalpur and incubated 37°C for 24 hours. The colonies were counted under the colony counter. One colony picked and washed in normal saline and spread on agar plate for re-culture and incubated for 24 hours. These cultures were washed with normal saline and then cultured in nutrient broth by incubating for 24 hours. A tenfold dilution of the suspended broth culture was prepared with normal saline. The total number of organisms was calculated by multiplying the number of organisms in one drop to the number of drops in one ml. Total number of *E.coli* in one ml volume was  $127 \times 10^7$ .

## 2.7 Induction of Pyrexia in Experimental Animals

Pyrexia was induced by injecting of *Escherichia coli* (*E.coli*) suspension, in the marginal ear vein of the rabbit at the concentration of 0.01 ml per kg body weight [7]. Rectal temperature was recorded with digital thermometer before and after *E.coli* injection at a regular interval during the experiment.

## 2.8 Drug Administration

The pyrexia was produced after 1-2 hours injection of *E.coli* suspension. The rectal temperature of animals raised 2-5 °F from normal body temperature of animals. The hydro-alcoholic extract of *Fagonia indica* was administered orally to animals at the dosage rate of 25mg, 50mg and 100mg/kg body weight dissolved in 3ml of distilled water.

## 2.9 Study Protocol

The rectal temperature was recorded with digital thermometer at 0 hour and *E.coli* suspension was injected. After one hour again rectal temperature of the animals was recorded and hydro-alcoholic extract were administered to the treatment groups and paracetamol hydro-alcoholic 50mg/kg orally to the

positive control group. Then rectal temperature was recorded at the interval of one hour for 4 hours. Five rabbits were in each group. Two groups were used as control groups as a positive control (paracetamol 50mg/kg administered) and other as negative control.

## 2.10 Antipyretic activity

Fever in rabbits was induced by injecting of *Escherichia coli* (*E.coli*) suspension, in the marginal ear vein of the rabbits at the concentration of 0.01 ml per kg body weight [7]. The animals having temperature were divided into five groups having five animals in each group and treated orally as follows:

- Group 1: Positive control: Given *E.coli* suspension
- Group 2: Negative control: Given paracetamol (50mg/kg)
- Group 3: Treatment group 1: Treated with plant extract (25mg/kg)
- Group 4: Treatment group 2: Treated with plant extract (50mg/kg)
- Group 5: Treatment group 3: Treated with plant extract (100mg/kg)

## 2.11 Statistically Analysis

Statistically analysis was performed by using one-way Analysis of Variance (ANOVA) test between two mean groups: control and test groups, followed by Student's t-test at  $p < 0.05$  level of significance as Table 1.

## 3. Results and Discussion

Antipyretic potential of hydro-alcoholic extract of *Fagonia indica* revealed significant antipyretic effect and reducing *E. coli* induced pyrexia in rabbits. After the drug administration (at hour 1), the decrease in body temperature of rabbits with the dose of 25mg/ kg<sup>-1</sup> during the next four hours ranged from 2.2- 3.0 °F as compared to the negative control. At the dose of 50mg/ kg<sup>-1</sup> the decrease in temperature was 2.1 – 3.9 °F. The decrease in body temperature of animals at the dose of 100mg/ kg<sup>-1</sup> was comparatively high, which ranged from 1.6 – 3.5 °F. The results indicated that dose of 100mg/ kg<sup>-1</sup> played a significant role in lowering the body temperature of the animals as compared to other treatment groups and negative as well as positive control groups. In general, fever is thought to be produced by certain endogenous substances including prostaglandins [8,9]. Therefore, the antipyretic action of hydro-alcoholic extracts of *Fagonia indica* may also be related to the inhibition of prostaglandin synthesis. The results of present study also correspond with the findings of [10-12].

**Table1** Antipyretic activity of *Fagonia cretica* on *E.coli* induced pyrexia in rabbits

Treatment	Dose (ml/kg)	Rectal temperature (°F)					
		Injecting <i>E. coli</i> suspension	Drug administration	After drug			
				0 h	1 h	2h	3 h
Control		101 ± 0.300	103 ± 0.177	103.3 ± 0.156	103.7 ± 0.969	104 ± 0.141	104.3 ± 0.139
Treatments	25mg	101.3 ± 0.283	103.5 ± 0.268	101.3 ± 0.188*	102 ± 0.238*	102.7 ± 0.278*	103.2 ± 0.313*
	50mg	101.1 ± 0.286	102.7 ± 0.303	100.6 ± 0.222*	101.2 ± 0.324*	102 ± 0.530*	102.6 ± 0.455*
	100mg	100.9 ± 0.186	102.4 ± 0.188	100.8 ± 0.230*	101.6 ± 0.096*	102.0 ± 0.124*	102.8 ± 0.247*
Paracetamol	50mg	100.8 ± 0.265	102.8 ± 0.213	101.4 ± 0.212*	102.1 ± 0.190*	102.8 ± 0.315*	103.4 ± 0.283

Mean ± SEM, \* P<0.05

Fever is a result of a finely tuned, complex event that involves both the peripheral immune system and the brain, through which a series of inflammatory and metabolic processes are regulated [13,14] and it is now commonly accepted that prostaglandin E2 (PGE2) is the final fever mediator in the brain, specifically in the preoptic area of the anterior hypothalamus [15], thus it may be plausible to conclude that the *Fagonia indica* extract inhibits the synthesis of prostaglandins, albeit to a very little extent.

As compared to the positive and negative control groups the maximum decrease in rectal temperature of the animals was recorded in dose rate of 100mg/kg, very closely followed by the dose rate of 50mg/kg and 25mg/kg.

#### 4. Conclusion

The herbal treatments are favored over the chemical ones for their compatibility to the human physiological system, easy availability and the rich knowledge about the traditional healing systems. The results achieved in the present study depicted that the hydro-alcoholic extracts of *Fagonia indica* possess dose dependent antipyretic activity. The results affirmed the claim by the herbal practitioners of the area which use this plant to cure fever and infectious diseases in humans. The therapeutic effect of the whole plant tends to be significantly more effective than the particular action of its known constituents and crude extracts can be recommended to cure bacterial infections successfully. However, in future the compounds exploration and identification of *Fagonia indica* may determine the real worth of this plant. The isolation and efficiency level of the active compound may open a new window of opportunity for the pharmacokinetics and a wild plant of the desert may become the focal point of the agronomists finding a respectable place in the agricultural fields.

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