Ethanolic Whole Plant Extract of Farsetia Jacquemontii Showed Antipyretic & Analgesic Potential in Mice

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ABSTRACT
To evaluate the analgesic and antipyretic activities of ethanolic whole plant extract of Farsetia jacquemontii (EWFJ) in mice. The plant is the habitat of Rajasthan & Northwestern parts of India. In folk system of medicine, it is known as “Faridbooti”, used traditionally in rheumatism, constipation, piles & abdominal pain. Antipyretic activity was assessed against Brewer’s yeast induced pyrexia in mice using paracetamol (100 mg/kg) as standard. Analgesic activity was determined against hot plate & acetic acid induced writhing method in mice using diclofenac sodium (10 mg/kg) as standard. EWFJ (400 mg/kg) showed significant antipyretic effect after 2 hours of treatment when compared with standard paracetamol (100 mg/kg) in Brewer’s yeast induced pyrexia model. EWFJ (400 mg/kg) reduced reaction time after 3 hours of treatment in the same manner as with standard diclofenac sodium (10 mg/kg) against hot plate method. EWFJ (400 mg/kg) showed the effect in similar manner as diclofenac sodium (10 mg/kg) against acetic acid induced writhing test. The study concluded antipyretic & analgesic effect of Farsetia jacquemontii.

Keywords: Antipyretic, Analgesic, Farsetia jacquemontii

INTRODUCTION
The importance of the reliability of medicinal plants had previously been focused on the treatment rather than the prevention of ailments. Despite that more than 90% of traditional medicinal remedies or formulations encompasses medicinal plants. Available literature also signified the implication of medicinal moieties from herbal resources in various preventive measures during adopted strategies for disease control.¹

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In India, there are so many considerations involved giving rise to the use of medicinal plants in traditional system of medicines. Population escalation, insufficient supply towards the demand of drugs, unaffordable cost of therapies, adverse effects of various drugs of synthetic origins as well as the unavoidable development of resistance to the existing antimicrobials have directed to amplify the prominence for constituents from plant resources of their medicinal value against the widespread diversity of disease in human beings.  

Medicinal plants are measured as a rich source of constituents used in development of newer drugs either non-pharmacopoeial, pharmacopoeial or synthetic drugs. Furthermore, some plants are regarded as significant resource of nourishment which results in recommendation of their uses in therapeutic systems. Some of such plants comprise aloe, ginger, walnuts, green tea, turmeric & pepper etc.  

Exhaustive available literature establishes the medicinal uses of plant sources of wide & diverse origin in almost all aerial ailments of human body. However, there are so many plants still lacking to be scientifically proven in support of their traditional uses. Amongst those *Farsetia jacquemontii* is one which is widely used in eradication of pain, fever, inflammation, rheumatism constipation, piles, abdominal pain traditionally by native peoples of Rajasthan and Northwestern parts of India.  

But its significance in these diseased conditions are still to be measured. Hence, this study encompasses the evaluation of antipyretic potential of *Farsetia jacquemontii* in mice.  

*Farsetia jacquemontii* belonging to the family *Cruciferae*, is the habitat of Rajasthan and Northwestern parts of India. In folk system of medicine, it is known as “Farid-booti”.  

**METHODOLOGY**

*Collection & Authentication*

The whole plant material was collected from native places of Jaipur (Rajasthan), in the month of January of 2018 which was authenticated by Prof. Alka Singh, Botanical department of Hindu college located at Moradabad (Uttar Pradesh), India wide letter no. 150118/B/09.

*Preparation of extract*

All aerial parts of *Farsetia jacquemontii* were dried in shade and powdered to a coarse form. The coarse powder was successively extracted according to their increasing polarity i.e. petroleum ether<chloroform<ethyl acetate<ethanol using continuous hot Soxhlet extractor at 60°C. The extracts were then concen-
treated under reduced pressure and preserved at low temperature for further evaluation of antipyretic & analgesic activity. After extraction, individual extracts were introduced to preliminary phytochemical screening. Ethanolic extract selected for the further analgesic & antipyretic activities due to the presence of polyphenols with ethanolic extract that might be responsible for such pharmacological effects. Moreover, ethanolic extract produced high yield amongst all the selective solvent system and suggested to be safer for human consumption.

**Chemicals and instruments**

All chemicals used in this study were of analytical grade purchased from sigma Aldrich. Reference standard paracetamol & diclofenac sodium was received as gift sample from AKUMS, Haridwar, UK, India.

**Animals**

Healthy & adult mice of swiss albino strain weighing from 20 g to 30 g of either sex was used for antipyretic activity. All mice were housed under standard laboratory conditions and were fed with standard animal feed with freely access to water. All adopted standard experimental protocols were approved from the IAEC (Institutional Animal Ethical Committee) with CPCSEA registration number 1205/PO/Re/08/CPCSEA.

The mice were divided in six groups. Each group contained 6 mice (n=6) in each group. All mice in each group were overnight fasted except free access to water before performing experimentation.

Groups were designed as follow:

**Group I (Control group):** received only saline.

**Group II (Standard group)** administered with paracetamol (100 mg/kg) for antipyretic activity whereas with diclofenac sodium (10 mg/kg) for analgesic activity.

**Group III (Test 1)** received 50 mg/kg of EWFJ.

**Group IV (Test 2)** received 100 mg/kg EWFJ.

**Group V (Test 3)** received 200 mg/kg EWFJ.

**Group VI (Test 4)** received 400 mg/kg EWFJ.
**Acute oral toxicity study**

OECD guidelines 423 were adopted for oral acute toxicity studies. The ethanolic extract was devoid of any toxicity in mice using oral route. Hence 50, 100, 200 and 400 mg/kg doses of extract were selected for the study.

**Antipyretic potential (pyrexia induced with Brewer’s yeast)**

Antipyretic potential of EWFJ was determined against pyrexia induced with Brewer’s yeast in mice. A digital thermometer was utilized to record the normal temperature. Then the pyrexia was induced with s.c. injection of a 20% aqueous suspension of Brewer’s yeast prepared as 10 mL/kg. Rectal temperature after eighteen hours was recorded and corresponding groups were served as per treatment with saline, standard & different doses of EWFJ respectively. Rectal temperature, at the interval of 0.5, 1, 2, 3- & 4-hours post drugs administration, were measured.

**Analgesic potential**

Analgesic potency of EWFJ was evaluated adopting following methods.

**Eddy’s hot-plate method**

Mice were placed on hotplate individually which was thermally constant at the temperature of 55°C. The time at which mice responded was noted down. Paw licking or the jumping (whichever appeared first) were the stimulus of pain perceived by mice after their respective treatments. A maximum of 15 seconds was kept as cut off time to avoid any injury to paws of mice. Percent increase in reaction time was noted (as index of analgesia) at each time interval (0.5, 1, 2, 3 hours).

**Writhing response induced with acetic acid**

Intraperitoneal injection of 1% (v/v) acetic acid at a dose of 2.3 ml/kg induced abdominal constriction in mice. Animals were pre-treated with their respective treatments, 30 min before acetic acid administration. The number of abdominal constrictions was cumulatively counted for twenty minutes. The percentage inhibition was calculated by using below given formula to record analgesic potential: 

\[
\text{Percentage Inhibition (Analgesic activity)} = \left[ \frac{\text{Mean of writhing count \{Control group- Treated group\}}}{\text{Mean of writhing count of control group}} \right] \times 100
\]
Statistical Analysis

Obtained data was illustrated in form of mean & SEM (Standard Error Mean). The data was further analyzed statistically adopting student’s t-test whereas in case of unpaired data, p-values were determined.

Results were assumed to be of significance if p-values were less than 0.05 whereas if p-values were found to be lesser than 0.005, then the results were expressed as highly significant.

RESULTS AND DISCUSSION

Antipyretic potential (pyrexia induced with Brewer’s yeast)

The obtained results are shown in Table 1 & Fig.1

| Table 1. Antipyretic activity revealed by different groups against pyrexia induced with Brewer’s yeast |
|--------------------------------------------------|
| **Groups**                         | Initial before yeast injection | 18 Hrs. after Yeast injection | Time after drug administration (hrs) | Rectal-Temperature (°C) |
|-----------------------------------|---------------------------------|---------------------------------|-------------------------------------|-------------------------|
|                                   | 0.5 hrs | 1 hr | 2 hrs | 3 hrs | 4 hrs                       |
| Control                           | 37.01±0.056 | 39.00±0.066 | 39.01±0.062 | 39.14±0.08 | 39.15±0.05 | 38.88±0.041 | 38.45±0.054 |
| Paracetamol (100 mg/kg)           | 37.12±0.052 | 38.99±0.085 | 38.66±0.094 | 37.88±0.077 | 37.9±0.082 | 37.23±0.084 | 37.02±0.061 |
| Ethanolic Extract (50 mg/kg)      | 36.99±0.101 | 39.11±0.055 | 38.80±0.042 | 38.45±0.071 | 38.66±0.079 | 38.42±0.051 | 38.12±0.031 |
| Ethanolic Extract (100 mg/kg)     | 37.10±0.081 | 39.1±0.072 | 38.45±0.055 | 38.66±0.056 | 38.22±0.072 | 37.99±0.034 | 38.10±0.051 |
| Ethanolic Extract (200 mg/kg)     | 37.06±0.068 | 39.9±0.062 | 39.1±0.055 | 38.22±0.066 | 38.01±0.087 | 37.76±0.034 | 37.33±0.045 |
| Ethanolic Extract (400 mg/kg)     | 37.12±0.045 | 38.99±0.064 | 38.45±0.049 | 37.91±0.067 | 37.45±0.045 | 37.33±0.10 | 37.12±0.081 |
Figure 1. Antipyretic activity revealed by different groups against pyrexia induced with Brewer’s yeast

Values are expressed as mean ± SEM (n=06): Significance at $p<0.001$ as compared to control

As revealed from obtained results, EWFJ (400 mg/kg) showed significant antipyretic effect after 2 hours of treatment when compared with standard paracetamol (100 mg/kg) in Brewer’s yeast induced pyrexia model.

The study affirmed the antipyretic potential of EWFJ (400 mg/kg).

**Analgesic Activity**

Analgesic activity of EWFJ was evaluated against Eddy’s hot-plate test & writhing response induced with acetic acid.

**Eddy’s Hot-Plate Test**

Obtained results from Eddy’s hot-plate test are shown in Table 2 & Fig.2.

As depicted in the figure, EWFJ (400 mg/kg) reduced reaction time after 3 hours of treatment in the same manner as with standard diclofenac sodium (10 mg/kg) when explored to hot plate method.

The study evidenced the existence of analgesic effect of EWFJ at the dose of 400 mg/kg.
### Table 2. Reaction time (seconds) shown by different groups at different time intervals.

| Groups                        | Reaction Time (Seconds) | Time after drug administration (Hrs) |
|-------------------------------|-------------------------|--------------------------------------|
|                               |                         | Initial | 0.5 hrs | 1 hr | 2 hrs | 3 hrs |
| Control                       | 6.12 ± 0.066            |         | 6.22 ± 0.068 | 6.18 ± 0.077 | 6.18 ± 0.06 | 6.20 ± 0.087 |
| Diclofenac Sodium (10 mg/kg)  | 6.31 ± 0.056            | 7.58 ± 0.054       | 8.60 ± 0.067       | 9.41 ± 0.062       | 9.23 ± 0.1092 |
| Ethanolic Extract (50 mg/kg)  | 6.12 ± 0.0479           | 6.25 ± 0.022       | 6.71 ± 0.042       | 7.10 ± 0.102       | 7.23 ± 0.066 |
| Ethanolic Extract (100 mg/kg) | 6.17 ± 0.073            | 7.11 ± 0.0676      | 7.25 ± 0.049       | 7.90 ± 0.067       | 7.85 ± 0.045 |
| Ethanolic Extract (200 mg/kg) | 6.15 ± 0.036            | 7.45 ± 0.062       | 7.73 ± 0.045       | 8.21 ± 0.063       | 8.20 ± 0.034 |
| Ethanolic Extract (400 mg/kg) | 6.15 ± 0.066            | 7.78 ± 0.063       | 7.78 ± 0.067       | 8.81 ± 0.098       | 8.85 ± 0.066 |

Values are expressed as mean ± SEM (n=06): Significance at p<0.001 as compared to control.

**Writhing Response induced with acetic acid**

Obtained results are summarized with the help of Table 3 & Fig.3. As shown in the figure, EWFJ (400 mg/kg) showed the effect in similar manner as diclofenac sodium (10 mg/kg) against acetic acid induced writhing test.
Table 3. Number of writhing & Percentage inhibition shown by different groups

| S. No. | Groups                           | No. of Writhing (Mean ± SEM) | % Inhibition |
|--------|----------------------------------|------------------------------|--------------|
| 1      | Control                          | 37.83                        |              |
| 2      | Diclofenac Sodium (10 mg/kg)     | 7.83                         | 79.3         |
| 3      | Ethanolic Extract (50 mg/kg)     | 24.66                        | 34.81        |
| 4      | Ethanolic Extract (100 mg/kg)    | 15.16                        | 59.92        |
| 5      | Ethanolic Extract (200 mg/kg)    | 10.16                        | 73.14        |
| 6      | Ethanolic Extract (400 mg/kg)    | 9.16                         | 75.79        |

Values are expressed as mean ± SEM (n=06): Significance at p<0.001⁴ as compared to control.

![Acetic acid induced writhing in mice](image)

Figure 3. Number of writhing & Percentage inhibition shown by different groups

The study revealed the analgesic potential of EWFJ at the dose of 400 mg/kg. Present study concluded the confirmation of antipyretic & analgesic potential of *Farsetia jacquemontii*. Antipyretic potential of ethanolic whole plant extract of *Farsetia jacquemontii* was measured against pyrexia induced in mice with Brewer’s yeast, using paracetamol at the dose of 100 mg/kg as standard and results demonstrated moderately significant (p<0.001) after 2 hours of pretreatment when compared to standard paracetamol. Analgesic activity of same was determined against hot plate method & writhing induced with acetic acid in mice using diclofenac sodium at the dose of 10 mg/kg as standard. The
results revealed EWFJ being significant \((p<0.001)\) confirming to antipyretic as well as analgesic effects of the plant.

The study will be beneficial for further researchers in progress to isolate as well as identify the compounds responsible for such activities.

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