

Evaluation of analgesic activity of *Emblia officinalis* in albino rats

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ABSTRACT

Background: Amla is one of the most often used herbs in indigenous medicine, whose all parts including fruit, seed, leaves, root, bark, and flowers are used in various Ayurvedic/Unani medicines. However, studies to establish analgesic potential of amla were limited, so the purpose of the present study was to evaluate analgesic activity of amla, if it possesses any.

Methods: Albino rats were divided randomly in three groups of six rats each. Group 1 (control) received distilled water orally, Group 2 (test) received *Emblia officinalis* extract in dose of 600 mg/kg orally and Group 3 (standard) received Pentazocine in dose 10 mg/kg intraperitoneally.

Results: *Emblia officinalis* extract did not produced statistically significant ($p > 0.05$) analgesia when compared with the control group in hot plate latency, but produced a statistically significant reduction in 6% NaCl induced abdominal writhing ($p < 0.05$).

Conclusions: Since the plant extract significantly reduced the number of writhes in abdominal writhing model, but do not increase hot plate latency, the commercially available crude extract of *Emblia officinalis* exhibit analgesic activity involving peripheral mechanisms.

Keywords: *Emblia officinalis*, Amla, Anti-nociceptive, Pain, Analgesic, Hot plate method

INTRODUCTION

Analgesics are drugs that are used to achieve relief from pain. Commonly known as painkillers, analgesics act in various ways on the peripheral and central nervous systems. They include a number of drugs like Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) such as salicylates, opioid drugs such as morphine. Analgesics are one of the most commonly used medicines in modern clinical practice.¹ However, the main problem with these groups remains that of side-effects such as respiratory depression, addiction in opiates, and gastrointestinal symptoms in NSAIDs.

The world is in a constant need of newer analgesics but with fewer side-effects. Keeping these concerns in mind, the researchers are now diverting their studies to nature's

medicines "the herbs", which can be used as a safe and effective alternate to these drugs. A number of herbs are being used in Ayurveda for relief of pain. Amla (*Emblia officinalis*) is such plants with analgesic potential.

Emblia officinalis (Figure 1), also known as *Phyllanthus emblica*, belongs to family Phyllanthaceae. It is commonly known as the Indian Gooseberry, Amalika (Sanskrit) and Amla (Hindi). It is worshipped as an auspicious fruit from ancient time and respected as a symbol of good health.

Amla is one of the most often used herbs in indigenous medicine, whose all parts including fruit, seed, leaves, root, bark, and flowers are used in various Ayurvedic/Unani medicines. It is traditionally used to enhance digestion, treat constipation, reduce fever, reduce cough, alleviate

asthma, stimulate hair growth, enliven the body, and enhance intellect.

Studies to establish analgesic potential of amla were limited, so the purpose of the present study was to evaluate analgesic activity of amla, if it possesses any.

METHODS

This study was conducted in the Department of Pharmacology, Moti Lal Nehru Medical College, Allahabad. Albino rats of both sexes (male and female) weighing between 100 and 150 g. were used. Albino rats were obtained from registered sellers (Reg. No.- B-37/0605003769) and kept in animal house under the supervision of veterinary doctor. All rats were housed at an ambient temperature of 25°C±2°C with a 12 hrs light/dark cycle, and provided with standard pellet diet and water *ad libitum*. The maintenance of the animals was in accordance with the guiding principles of Institutional Animal Ethics Committee and guide for the care and use of laboratory. Animals published by the National Institute of Health (NIH Publication. No. 85-23 revised 1996, Latest revision in 2011). All the experimental procedures and protocols used in the study were reviewed and approved by Institutional Ethics Committee (Approval No. IEC/MLNMC/2013/No.11).

Test drugs and chemicals

All drugs were administered orally with the help of feeding tube after preparing suspension in distilled water (vehicle).

Emblica officinalis extract

It was procured as commercially available crude extract in dry powder form, from the Himalaya Drug Co., Bengaluru, India. It was given in a dose of 600 mg/kg orally.²⁻⁴

Pentazocine

It was obtained from Neon Laboratories, Mumbai. It was given in dose 10 mg/kg by intraperitoneal route.



Figure 1: *Emblica officinalis* (Amla).

Sodium chloride

It was obtained from S.D. Fine-Chem Ltd., Boisar.

Experimental protocol

18 albino rats were taken and screened by hot plate for abnormal response (latency >30 s). Then these rats were divided randomly (using a random number table) into three groups of six rats each (Table 1).

Anti-nociceptive activity

The anti-nociceptive activity was evaluated using a hot plate and abdominal writhing method (Figure 2 & 3).

Table 1: Groups of animals (n=6 for each group).

Group no.	Group name	Drug administered	Dose
1	Control	Distilled water	0.4 ml
2	<i>Emblica officinalis</i>	<i>Emblica officinalis</i> extract	600 mg/kg
3	Standard	Pentazocine	10 mg/kg

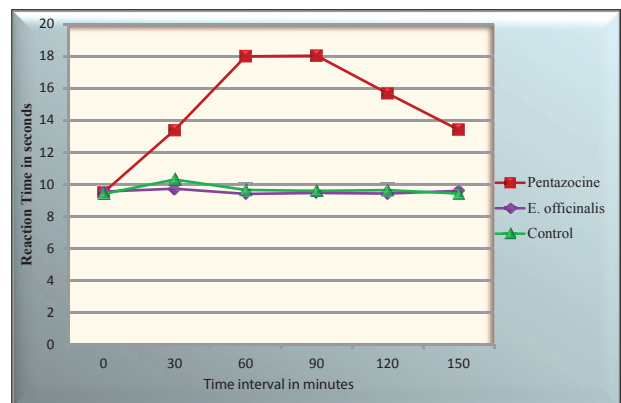


Figure 2: Line diagram showing hot plate latency.

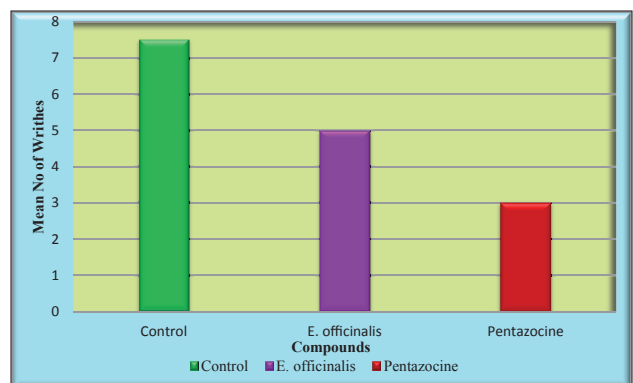


Figure 3: Bar diagram representing mean no. of abdominal writhes.

Hot plate method

The method, originally described by Woolfe and MacDonald⁵ has been modified by several investigators. The animal was placed on the hot plate, maintained at 55°C±1°C temperature, and the time until either licking of paw or jumping occurs was recorded by a stop-watch. The latency was recorded before and 30, 60, 90, 120, and 150 min after the administration of the control, standard or the test compound. A cut-off period of 30 s was observed to avoid damage to the paws. The values of the reaction time of experimental groups were compared with that of the control group. The prolongation of the latency times indicated the anti-nociceptive activity.

Abdominal writhing test

The writhing phenomenon in rats was demonstrated by Fukawa et al.⁶ Pain is introduced by injection of irritants into the peritoneal cavity of rats. The animals react with a characteristic stretching behavior which is called writhing. The control, test or the standard compound were administered to the test animals. Forty-five minutes later 6% sodium chloride solution⁷ was injected intraperitoneally then each rat was placed individually into glass beakers and the number of writhes occurring between 5 and 20 min after sodium chloride injection was counted for each animal. For scoring purposes, writhes is indicated by stretching of the abdomen with simultaneous stretching of at least one hind limb. The formula for computing percent inhibition is:

$$\frac{(\text{number of writhes in control group} - \text{number of writhes in test group})}{\text{number of writhes in control group}} \times 100$$

Statistical analysis

The observations were analyzed using one-way "ANOVA" and "student t test" where ever needed and p<0.05 was considered as statistically significant.

RESULTS

The study was carried out in albino rats of either sex weighing 100-150 g. Experimental pain models, response

to thermal stimulation by hot plate and abdominal writhing, were used for assessing the analgesic effects in rats. The test compound was administered orally, while the standard drug Pentazocine was administered intraperitoneally.

Hot plate method

The mean hot plate latency of all three groups, before administration of compound (0 min), was compared using ANOVA which revealed similar mean baseline hot plate latency among the groups (F=0.006, p>0.05). Results of hotplate test are presented in Table 2. *Emblca officinalis* extract did not produced statistically significant (p>0.05)analgesia when compared with the control group.

Abdominal writhing method

Emblca officinalis extract produced a statistically significant reduction in 6% NaCl induced abdominal writhing (p<0.05). Results are presented in Table 3.

DISCUSSION

The Extract showed significant activity in abdominal writhing method. The abdominal writhing test is normally used to evaluate the peripheral analgesic effect of drugs and chemicals. The response is thought to be mediated by peritoneal mast cells, acid sensing ion channels and the prostaglandin (PG) pathway.^{8,9} Hence, the extract might possess analgesic activity involving peripheral mechanisms.

The hot plate method is considered to be selective for the drugs acting centrally. The hot plate test measures the complex response to a non-inflammatory, acute nociceptive input and is one of the models normally used for studying central nociceptive activity.¹⁰ It is an established fact that any agent that causes a prolongation of the hot plate latency using this test must be acting centrally.¹¹ Therefore, the extract of the plant probably does not have a central activity.

The analgesic effect of the extracts may be due to its anti-inflammatory action as in the case with salicylates, which are particularly effective in relieving the pain associated with

Table 2: Effect of *Emblca officinalis* hot plate latency in groups.

Groups	Mean latency (seconds)±SD at time interval (minutes)					
	0	30	60	90	120	150
Control	9.40±2.07	10.30±2.34	9.64±2.42	9.59±2.36	9.63±1.73	9.42±2.19
<i>Emblca officinalis</i>	9.54±2.09	9.72±2.13	9.40±2.18	9.46±2.17	9.42±2.10	9.59±1.99
Standard	9.50±2.14	13.38±1.30*	17.99±1.37*	18.03±1.15*	15.68±1.53*	13.41±1.81*

*p<0.05

Table 3: Effect of *Emblica officinalis* on abdominal writhing.

Groups	No. of writhes	% Inhibition
Control	7.50±1.05	
<i>Emblica officinalis</i>	5.00±0.89*	33.3
Standard	3.00±0.89*	60

*p<0.05

inflammation (or) edema. The plant has some influence on PG biosynthesis.³

The mechanism of analgesic activity of the standardized water extract of *Phyllanthus emblica* seems to be similar to NSAIDs rather than to steroidal drugs. Inhibitory effect on the synthesis and/or release of inflammatory or pain mediators such as PG may be the main mechanisms of action of *Phyllanthus emblica* water extract.⁴

A flavonoid “Rutine” isolated from *Emblica officinalis* which belongs to quercetin group has an inhibitory effect on 5-lipoxygenase pathway (the main pathway for production of chemical mediators important in pain and inflammatory processes). The extracts induced antinociception in the late phase of formalin test is partly mediated by peripheral mechanism like diclofenac acid.²

Preliminary phytochemical screening of the plant extract gave positive test for alkaloids, tannins, phenolic compounds, carbohydrates and amino acids, which might be in part responsible for antipyretic and analgesic activities.³

The exact mechanisms of activity are not yet very well elucidated. The proposed mechanisms need to be explored further through extensive studies.

CONCLUSIONS

The plant extract significantly reduced the number of writhes in abdominal writhing model but do not increase hot plate latency in hot plate model, the commercially available crude extract of *Emblica officinalis* exhibit antinociceptive activity involving peripheral mechanisms. More studies are needed to elucidate final decision about the analgesic activity, optimum dose, and the exact mechanism of action.

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Ethical approval: Not required

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