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RESEARCH ARTICLE

# Comparative study of analgesic activity of *Lagenaria siceraria* root extract with pentazocine in albino mice

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## ABSTRACT

**Background:** Medicinal plants have been the source of innumerable drugs. Opioids derived from plants are commonly used analgesics. However, they are associated with side effects ranging from vomiting, constipation to tolerance, and dependence. Hence, the search for safe and efficacious analgesic is on-going. **Aims and Objectives:** The aim of the study was to assess the analgesic potential of the ethanolic extract of *L. siceraria* roots (EELSR) in albino mice by radiant heat method and to compare it with pentazocine. **Materials and Methods:** Albino mice were divided into four groups randomly. Group 1 was given saline (0.1 mg/kg) orally (control). Group 2 was injected pentazocine 4 mg/kg (standard) intraperitoneally. Groups 3 and 4 were test groups and were administered EELSR 100 mg/kg BW and 200 mg/kg BW orally, respectively. Radiant heat method was used to screen for analgesic potential. **Results:** Our study demonstrated the steady increase in reaction time in the test groups which received EELSR at both the doses. Maximum analgesic activity was observed at 60 min. EELSR has good analgesic activity in comparison with control. However, pentazocine has significantly better activity than EELSR at both the doses. EELSR at 200 mg/kg BW has comparable analgesic activity to pentazocine only at 15 min. **Conclusion:** The EELSR has analgesic potential, but pentazocine is more potent analgesic than EELSR.

**KEY WORDS:** *Lagenaria siceraria*; Mice; Radiant Heat; Pentazocine; Analgesic

## INTRODUCTION

Medicinal plants have been the source of innumerable drugs which are prescribed currently. They still remain a major unexploited source of novel drugs.[1] Opium derived from plants has been used to relieve pain since prehistoric era.[2] Opioids are one of the commonly used analgesics even today. However, they cause side effects such as nausea, vomiting, sedation, dizziness, constipation, tolerance, physical dependence, and respiratory depression.[3] These side effects, development of tolerance to its analgesic action, and addiction causing potential have led to disinclination in use of opioids for non-cancer pain. Hence, the search for new compounds with analgesic potential which are associated with relatively less side effects while having good efficacy for pain relief is on-going.[4]

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Several plant extracts have the potential to be developed into novel analgesics. *Lagenaria siceraria* is a medicinal plant belonging to Cucurbitaceae family.[5] It is used in traditional medicine for treating hypertension, diabetes mellitus, weight loss, liver diseases, etc.[6] It has antioxidant,[7] cytotoxic,[8] anticancer,[9] immunomodulatory,[10] antidepressant,[11] antistress,[12] and antimicrobial activities.[13] Phytochemical

screening of the plant extract showed the presence of alkaloids, flavonoids, sterols, carbohydrates, and triterpenoids. High-performance liquid chromatography analysis revealed that flavones-c glycosides are present in the plant.[14] In continuation with the efforts to discover a safe and potent analgesic compound from plant source, the present study was planned with the objectives to assess the ethanolic extract of *L. siceraria* roots (EELSR) for its analgesic potential in albino mice by radiant heat method and to compare it with pentazocine, an opioid analgesic.

## MATERIALS AND METHODS

### Animals

Albino mice of both the genders, 20–25 g weight and 7–8 weeks old, were selected. They were acquired from the animal house of Sri Kaliswari College, Sivakasi, India. They were maintained at 25 ± 2°C temperature, 35–60% humidity, and light-dark cycle of 12 h. They were provided standard pellet diet and water *ad libitum*. The Institutional Animal Ethics Committee approved the current study.

### Preparation of Plant Extract

The *L. siceraria* roots were dried and powdered. This dry powder was extracted in 80% ethanol using Soxhlet apparatus. It was filtered using Whatman no. 1 filter paper. The concentration of filtrate was done on rotary evaporator. The extract was stored in airtight sterile container.

### Chemicals

The standard drug - pentazocine was purchased from Dabur Pharma Ltd., Tarapur, Thane. Ethanol and other chemicals were bought from Sigma Aldrich Pvt. Ltd., Bengaluru, India. All chemicals were of analytical grade.

### Experiment

Albino mice were divided into the following groups: Group 1 was given saline (0.1 mg/kg) orally (control). Group 2 was injected pentazocine 4 mg/kg (standard) intraperitoneally. Groups 3 and 4 were test groups and were administered EELSR 100 mg/kg BW and 200 mg/kg BW orally, respectively.

### Analgesic Activity

The radiant heat method (tail flick method) was employed to assess the analgesic activity. The animals were placed in a restrainer which has an opening for the tails. A timer was started simultaneously and the time taken for the mice to withdraw their tails was recorded. This period is the reaction time. The reaction time was recorded at intervals of 15, 30, 60 and 120 min after administering the respective treatments to the various groups. The lengthening of reaction time after administration of drug is taken as the analgesic potential of that drug.[15,16]

### Statistical Analysis

The data from the study was represented as mean ± standard error of mean. The statistical tests employed were one-way ANOVA and Dunnett test. $P < 0.05$ was considered to be statistically significant.

## RESULTS

The results of the radiant heat (tail flick) method are shown in Table 1. It can be observed that the reaction time (seconds) has steadily increased from 15 min to 60 min in both the test groups (Groups 3 and 4) which are given EELSR at 100 mg/kg BW and 200 mg/kg BW, respectively. However, the effect is not sustained at 120 min. The extract exhibits maximum activity at 60 min. The standard drug pentazocine (Group 2) has produced a sustained elevation of reaction time upto 120 min [Table 1].

EELSR at 100 mg/kg BW (Group 3) has increased the reaction time significantly at 15 min ($P < 0.001$) in comparison with the control group. However, when compared with pentazocine (standard), it was found that pentazocine is significantly better than EELSR ($P < 0.05$) [Table 1]. Group 4 (EELSR 200 mg/kg BW) has produced a statistically significant increase in the reaction time at 15 min and 60 min ($P < 0.001$) in comparison with control. The analgesic potential of EELSR at 200 mg/kg is comparable to pentazocine (Group 2) only at 15 min. From 30 to 120 min, pentazocine has greater analgesic effect ($P < 0.001$) [Table 1].

## DISCUSSION

The current study analyzed the EELSR for analgesic potential at the doses of 100 mg/kg BW and 200 mg/kg BW in comparison with pentazocine, an opioid analgesic. In the study, pain was induced by radiant heat. This method is highly effective for estimating the efficacy and potency of centrally acting analgesics.[17] Albino mice were employed for the study because they are suitable for screening of analgesic activity. Our study has demonstrated the steady increase in reaction time in the test groups which received EELSR at both the doses. Maximum analgesic activity was observed at 60 min. EELSR has good analgesic activity in comparison to control. However, pentazocine has significantly better activity than EELSR at both the doses. EELSR at 200 mg/kg BW has comparable analgesic activity to pentazocine only at 15 min. These observations suggest that EELSR has analgesic potential, but pentazocine is more potent analgesic than EELSR.

**Table 1:** Reaction time in seconds noted in tail flick method

| Groups | 15 min | 30 min | 60 min | 120 min |
|---|---|---|---|---|
| Control | 6.2±0.02 | 18±0.08 | 29±0.07 | 21±0.09 |
| Standard (pentazocine 4 mg/kg) | 32±0.06$^{a***}$ | 69±0.03$^{a***}$ | 72±0.11$^{a***}$ | 78±0.12$^{a***}$ |
| *Lagenaria siceraria* root extract (100 mg/kg BW) | 21±1.0$^{a***,b*}$ | 22±0.09$^{b***}$ | 36±0.05$^{b***}$ | 10±0.02$^{a**,b***}$ |
| *Lagenaria siceraria* root extract (200 mg/kg BW) | 23±0.03$^{a***}$ | 27±0.01$^{b***}$ | 40±0.06$^{a**,b***}$ | 15±0.04$^{b***}$ |

Data are presented as mean±standard error of mean. *$P$<0.05, **$P$<0.01, ***$P$<0.001. Superscripts (a) indicate comparison of data with control group while (b) is comparison with standard

Various studies have reported the analgesic potential of *L. siceraria* extract. In independent studies done by Shah and Seth[18] and Harini and Jayasree,[19] *L. siceraria* fruit extracts have shown analgesic activity. The analgesic activity of *L. siceraria* seed extract was reported by Gill *et al.*[20] The antinociceptive activity of aerial parts of *L. siceraria* was described by Saha *et al.*[21] These similarities may be due to the standard screening methods used in these studies. The progressive increase in reaction time in tail flick method in our study suggests that the analgesic action of EELSR may have central origin.[17]

The strengths of the current study are that radiant heat (tail flick) method was used for screening analgesic potential of EELSR which is a reliable, reproducible, and extensively used method for screening centrally acting analgesics. The analgesiometer was tested and calibrated before the study to avoid injury to experimental animals. Albino mice were used for the present study because they are suitable and extensively used for testing analgesic potential. The limitation of this study was that it was done in a limited number of mice.

The observations of our study suggest that EELSR has analgesic activity in albino mice. However, pentazocine is a more potent analgesic when compared to EELSR.

## CONCLUSION

According to our study, EELSR has analgesic activity by radiant heat method in albino mice. However, its activity is not comparable to pentazocine which has better analgesic activity.

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