



“AN EXPERIMENTAL STUDY OF CUMINUM CYMINUM FOR ITS ANALGESIC PROPERTIES IN ALBINO RAT”

Pharmacology

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ABSTRACT

AIM: To evaluate the analgesic property of Cuminum Cyminum in albino rats.

METHODOLOGY: We have conducted "tail-flick methods" on albino rats for analgesic activity, rats were divided into three groups for Group I consisting of six animals, served as control and received distilled water. Group II subdivided into three groups II-A, II-B, II-C, consisting of six animals each, received Cuminum cyminum in three doses of 300mg, 750 mg, 1000mg per orally respectively. Group III subdivided into three groups III-A, III-B, III-C, consisting of six animals each, received the standard drug in three doses per orally.

RESULT: Cuminum cyminum increased the reaction time which was variable with different doses and time periods (after 30, 60, 90 minutes of oral administration). At 30 minutes, the reaction time was not significant in a lower dose (300 mg per kg) while reaction time was highly significant in higher doses and after 60 and 90 minutes.

CONCLUSION: Aqueous extract of Cuminum cyminum is having significant analgesic activity property in the albino rat. It could be highly significant but because extract got heat thermal degradation so it may be lost some of its property. However further study needed to find out its mechanism of actions and chemical constitutes responsible for this activities.

KEYWORDS

Cuminum Cyminum, Analgesic, Tramadol, Albino Rat,

INTRODUCTION

The use of plants as a source of medicinal agents lies deep in the roots of antiquity. No one will ever know what led primitive human being emerging from ancestral origin to select certain plant material for the treatment of human suffering. There was a conscious realization that certain roots, leaves, barks, fruits, seeds, and even plant exudations had some beneficial actions. The routes of many of the modern therapeutic agents can be traced back to the plants used in ancient societies. In countries like India, China and Greek, with well-developed indigenous systems of medicine have a sound theoretical basis. Their use got incorporated into the material medicas of these systems of medicine.

Sir Col RN Chopra is known as Father of Pharmacology in India. He initiated and inspired systemic modern pharmacological research on medicinal plants to put indigenous drugs on a scientific footing and promoted the role of indigenous drugs in national health care.

Cuminum cyminum (Jeera) has been one of the common constituents of home-based spices. Jeera is a widely distributed plant and used in all parts of the world as a spice. Its importance has already been recognized several thousand years ago in ancient India. It was regarded as one of the important foodstuff and medicinal plant. Cuminum cyminum originated in India & North Africa. Jeera is commonly used as a condiment in Indian homes. It shows antispasmodic, astringent, antiseptic, antioxidant, diuretic, antimicrobial^{2,3,4}, antianxiety, analgesic, anti-inflammatory, carminative, anticonvulsant, and many other properties suggested by its results on a preliminary study on animals and human clinical trials^{5,6,7}.

According to ayurveda⁸ "Shubhrajeeram katu graahi paachanam deepanam laghu Garbhashayashuddhikaram ruksham balyam sugandhikam Tiktham vamikshayaadhmaanam vaatam kushtam visham jwaram" means jeera exhibits several medicinal properties like:- reduces superficial inflammation and pain, It digests food and normalizes vata in digestive system, reduces pain experience during indigestion, decrease flatulence, decrease heaviness of stomach, purify the blood, act on female reproductive system by reducing inflammation of uterus, increases milk production in lactating mother and It is a skin-friendly herb and reduces itching.

In the modern era, scientists have been trying to validate many of these properties of Jeera, especially to identify its active components, its

mechanisms of action and exploring its potential benefits as food supplements or useful with specific therapy.

In the present study, an attempt has been made to study the analgesic properties of Cuminum cyminum (Jeera) seeds in albino rats and its effects are compared with distilled water and tramadol.

METHODOLOGY

The present study was conducted in the Department of Pharmacology, Dr. S. N. Medical College, Jodhpur, (Rajasthan). Ethical approval was taken prior to the starting of study from the institutional ethical committee and from institutional animal ethical committee. All guidelines were strictly followed during the study.

Experimental Animals

The albino rates were used as experimental animals. Adult albino rats of either sex (100-150g) were divided into three groups Group I consisting of six animals, served as control and received distilled water. Group II subdivided into three groups II-A, II-B, II-C, consisting of six animals each, received Cuminum cyminum in three doses of 300mg, 750 mg, 1000mg per orally respectively. Group III subdivided into three groups III-A, III-B, III-C, consisting of six animals each, received the standard drug in three doses per orally.

In this preliminary study, parameters like analgesic property were studied, in the above-mentioned animal groups.

Drugs under study with doses

(A) Test drugs for all experiments

- Cuminum cyminum 300 mg per kg
- Cuminum cyminum 750 mg per kg
- Cuminum cyminum 1000 mg per kg

(B) Standard drugs for analgesic activity

- Tramadol 5 mg per kg
- Tramadol 10 mg per kg
- Tramadol 15 mg per kg

Preparation Of Drug Solution By Hot Continuous Extraction Method : We have collected aqueous extract of Cuminum cyminum through

soxhlet apparatus by hot continuous extraction method. The use of commercially available Soxhlet apparatus is a convenient way to prepare crude plant extract.

Mode of Administration

Cuminum cyminum and the standard drug were administered orally by feeding needle, in various doses in the in-vivo experiment, half an hour before the actual procedure.

Experimental setup of Analgesic activity

We have conducted "tail-flick methods" on albino rats for analgesic activity. The tail-flick method was originally described by 'D'Amour & Smith for testing analgesic activity in albino rats. The tail flick test is a widely and reliably used test for revealing the potency of opioid analgesics. Heat is used as a noxious stimulus. The stimulus causes a simple nociceptive spinal reflex response in which the rat flicks its tail away from the heat source. It is a very useful test for discrimination between centrally acting morphine-like analgesics and nonopioid analgesics'.

An analgesiometer consists of nichrome wire which can be continuously heated at different intensities. It also consists of an amount to check the current flow, the heated nichrome wire acts as noxious stimulus and time took for the animal to withdraw its tail is noted down with the help of a stop-watch. On either side of nichrome wire, there are metallic square tubes through which water is passed continuously for cooling. Thus, only the part above nichrome wire is heated while the other part as not affected. The circulation of cold water prevents dispersion of heat in the surrounding area.

Animals were divided into three groups like I, II-A, II-B, II-C, III-A, III-B, III-C, each group was balanced for a weight consisted of six animals. The experiment was carried out after testing the reaction time of each rat to pain stimulus by radiant heat of red hot nichrome wire on the tail. A rat was pushed in a rat holder so that the tail came out of the holder through the slit in the lid. Rattail was placed through the slit in the water jacket over the nichrome wire. The heating element of the analgesiometer allowed free flow of water through the limbs of the water jacket. Put the mains switch on after connecting analgesiometer to the mains. Put on the pilot switch after checking that everything was in order, (specially tail which should be horizontally placed over the heating element but should not touch it). The basal reaction time (latent period) recorded before the tail was withdrawn with a jerk then immediately off the pilot switch. Current was so adjusted that each reaction time is approximately 4-5 seconds (usually 5-6 ampere current is ideal).

Escape reaction-

Mouse tries to pull tail away and rotates the head this reaction is known as escape reaction. The escape reaction, which is the end point of the test, can be regarded as a complex phenomenon mediated by the brain. In contrast, the simple tail flick as an end point of this test may be mediated as a spinal reflex. Therefore, observations of the escape reaction can be regarded as a true assessment of the influence of the drug on the brain.

In drug-treated group (II-A, II-B, II-C) thirty minutes prior to experiment test drug Cuminum cyminum administrated orally. The reaction time was recorded after distilled water and drug administration of test drug in different animals. The standard dose of tramadol 5, 10, 15 mg per kg also given orally in group III-A, III-B, III-C animals. Reaction time was noted at 30-60-90 minutes. Increase in reaction time percentage was calculated (Index of analgesia) at each time interval. A lengthening of the reaction time was interpreted as an analgesic action of the test drug.

RESULTS

Analgesic activity of Cuminum cyminum (jeera) was evaluated from "Tail flick method" on analgesiometer and reaction time was observed. Three orally administered dose level 300, 750, 1000 mg per kg of Cuminum cyminum were tested for analgesic activity. Test drug was compared with Tramadol which was used as the standard drug. Cuminum cyminum increased the reaction time which was variable with different doses and time periods (after 30, 60, 90 minutes of oral administration). At 30 minutes, the reaction time was not significant (P > 0.05) in a lower dose (300 mg per kg) which shown in table 1 and figure 1 while reaction time was highly significant (P < 0.001) in higher doses (750, 1000 mg per kg). Reaction time was increased by 1.5%,

25%, 46% respectively with doses of Cuminum cyminum 300, 750, 1000 mg per kg shown in table 1, figure 1 and figure 2. Tramadol has a significant effect on the reaction time [P < 0.001] in all the three doses. Tramadol has increased the reaction time by 63%, 57%, and 67% respectively with all three doses of Cuminum cyminum.

At 60 minutes, the reaction time was significant (P < 0.05) in lower dose (300 mg per kg) and reaction time was highly significant (P < 0.001) on higher doses (750, 1000 mg per kg). Reaction time was increased by 7%, 25%, 51% respectively with all the three doses of Cuminum cyminum. Tramadol has highly significant for the reaction time [P < 0.001] in all the three doses. Tramadol has increased reaction time by 58%, 59%, and 67% respectively with all the three doses of Cuminum cyminum.

At 90 minutes, the reaction time was not significant (P > 0.05) in lower dose (300 mg per kg) while reaction time was highly significant (P < 0.001) in higher doses (750, 1000 mg per kg). Reaction time was increased by 2%, 31%, 54% respectively with all the three doses of Cuminum cyminum. Tramadol has highly significant the reaction time [P < 0.001] in all the three doses. Tramadol has increased reaction time by 66%, 54%, and 65% respectively with all three doses of Cuminum cyminum.

- Group one was compared with group II-A, II-B, II-C, after three different lag periods (30, 60, 90 minutes), respectively.
- Groups III-A, III-B, III-C were compared with groups II-A, II-B, II-C, after three different lag periods (30, 60, 90 minutes), respectively.
- "Student's t-test" was used to compare different groups.

Table-1: Effect of Cuminum cyminum and Tramadol on Analgesic Activity

Group	Treatment	Oral Dose mg/kg	Reaction Time in Second Mean ± S.E.			Percent Reduction %			'P' Value		
			30 Minutes	60 Minutes	90 Minutes	30 Min.	60 Min.	90 Min.	30 Min.	60 Min.	90 Min.
I	Control	Distilled water	3.25±0.03	3.36±0.08	3.41±0.05						
II-A	Cuminum cyminum	300	3.31±0.04	3.6±0.05	3.48±0.05	1.5	7	2	>0.05	<0.05	>0.05
II-B	Cuminum cyminum	750	4.10±0.08	4.2±0.07	4.50±0.08	25	25	31	<0.01	<0.001	<0.001
II-C	Cuminum cyminum	1000	4.76±0.06	5.16±0.09	5.26±0.05	46	51	54	<0.01	<0.001	<0.001
III-A	Tramadol	5	5.41±0.09	5.7±0.11	5.81±0.12	63	58	66	<0.01	<0.001	<0.001
III-B	Tramadol	10	6.45±0.07	6.71±0.07	6.95±0.07	57	59	54	<0.01	<0.001	<0.001
III-C	Tramadol	15	8.31±0.05	8.58±0.14	8.70±0.14	74	67	65	<0.01	<0.001	<0.001

Each group consist of 6 animals, n=6

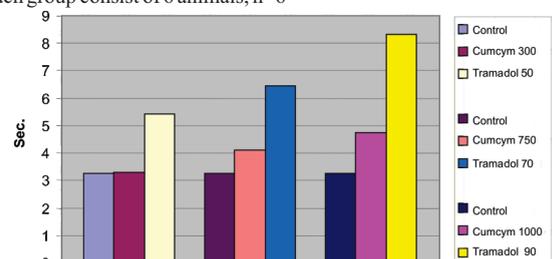


Figure 1: Effect of Cuminum cyminum and Tramadol on Analgesic Activity in Albino Rats (Mean Reaction time at 30 Minutes)

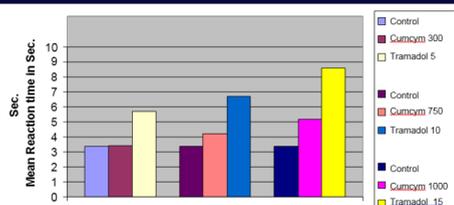


Figure 2: Effect of Cuminum cyminum and Tramadol on Analgesic Activity in Albino rats (Mean Reaction time at 60 Minutes) (Cumcym = Cuminum cyminum)

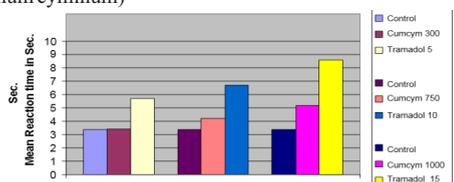


Fig.3 Effect of Cuminum cyminum and Tramadol on Analgesic Activity in Albino rats (Mean Reaction time at 90 Minutes) (Cumcym = Cuminum cyminum)

DISCUSSION

In his study analgesic property of the aqueous extract from Cuminum cyminum by tail flick method in comparison with distilled water as a negative control and tramadol as positive control were studied. Cuminum cyminum increased the reaction time which was variable with different doses (300, 750, 1000 mg per kg) and time periods (after 30, 60, 90 minutes of oral administration). At 30 minutes, the reaction time was not significant in 300 mg per kg dose while reaction time was highly significant ($P < 0.001$) in higher doses (750, 1000 mg per kg) post cumin 30, 60, 90 minutes respectively. In support of our study, Purnima et al demonstrated in their study that cumin has analgesic activity¹⁰. Similar to our study Bhat et al stabilized the analgesic and anti-inflammatory activities of the aqueous and ethanolic extracts of C. cyminum seeds in animal models¹¹. Review article of Al-snafi¹² and Srinivasan K¹³ also support the analgesic activity of Cuminum cyminum.

Mohammad Sayyah et al stated that essential oil of Cuminum cyminum demonstrates the significant analgesic effect in formalin test¹⁴. It has not shown analgesic activity in the tail-flick test. Results show that the essential oil exerts a significant inhibitory effect on the nociceptive response of the late phase of the chemical pain model, formalin test^{15,16}. Experimental results have indicated that Substance-P participates in the early phase, while histamine, serotonin, excitatory amino acids, and prostaglandins are involved in the late phase of formalin test with bradykinin affecting both the phases¹⁷. So, it seems that there is a possible interaction of the active constituents of the essential oil with mediators involved in the peripheral pain^{18,19}. In support of this hypothesis, Srivastava has shown that ether extract of Cuminum cyminum inhibits eicosanoid synthesis with a simultaneous increase in the formation of lipoxigenase-derived products²⁰. It has been reported that one of the constituents of the essential oil of Cuminum cyminum, myrcene, possesses peripheral analgesic effect on the hyperalgesia induced by prostaglandins in the rat paw test^{21,22}. Thus, it can contribute to the analgesic effect of the essential oil²³.

Conclusion

In our study, we demonstrated that aqueous extract of Cuminum cyminum is having significant analgesic activity property in the albino rat. It could be highly significant but because extract got heat thermal degradation so it may be lost some of its property. However further study needed to find out its mechanism of actions and chemical constituents responsible for these activities.

Limitation of study

This study has its limitation especially experiment are conducted only by Tail flick method and the solvent is being recycled, the extract that collects in the lower container is continuously being heated and may suffer thermal degradation reactions. To overcome this limitation need further study with more advanced test and extract without heat degradation.

Acknowledgments

The authors express their thanks to the Dr. Omi Chouhan, Ex-Head of Department, Department of Pharmacology, Dr. S. N. Medical College, Jodhpur (Rajasthan) for her guidance and assistance in conducting the study.

Conflict of Interest

The authors declare that no conflict of interest, financial or otherwise exists.

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