

## Relaxant Effect of *Carum copticum* on Intestinal Motility in Ileum of Rat

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**Abstract:** There are many biological investigations that have been done to determine cure for the dysfunction of GIT, using herbal medicine. It has been reported that *Carum copticum* is a plant in Umbelliferae family grows as herb with feliciaform roots, possesses bactericidal, anticholienergic and antistaminic activities. In addition, it has also Beta-adrenergic stimulatory effects. However, these effects of *Carum copticum* are not yet identified with respect to mechanical activities of isolated tissues. Therefore, the present study has been designed to find out the specific effects of *Carum copticum* on mechanical activity of ileum, both qualitatively & quantitatively. In this study anaesthetized rats (male albino rat) will be used in experiments for mechanical recording through isolated organ bath and oscillograph. The affect of *Carum copticum* obtained on intestinal motility will also be tested for receptors identification and differentiation with cholinergic and adrenergic agents. The results showed the effective concentrations of acetyl choline causing 50% of maximum response (EC50) obtained in the presence of 0.01 extracts in all five sets of experiments were significantly higher than those of saline (P = 0.000) and also the maximum response to acetyl choline obtained in the presence of extracts were lower (P = 0.000) The results of this study indicated a competitive antagonism effect of *Carum copticum* at acetyl choline receptors. An anti-cholinergic property of the plant were also suggested

**Key words:** *Carum copticum* • herb • ileum • intestinal motility

### INTRODUCTION

One of the most important dysfunction's in gastrointestinal tract (GIT) is diarrhea, which may produced by some infections. Diarrhea is a common symptom in infection [1, 2]. That cause loss of ions absorption in the intestine [3] and so intestinal motility [4, 5]. Intestinal motility is controlled by intrinsic and extrinsic nerves that release a variety of transmitters, circulatory hormones and the enteric system.

The cycle of events resulting in the contraction of a muscle fiber is triggered by sharp and pronounced depolarization changes in the surface membrane polarity. Resting membrane potential is the characteristic of almost all living cells. An electrical potential difference exists across the plasma membrane. This is regarded as the resting membrane potential [6]. Many visceral muscles, particularly those of the alimentary canal, are spontaneously active and their membrane potential are rhythmically interrupted by slow wave like depolarization

upon which there are usually superimposed various spike like discharges. The action potential of visceral muscle is exceedingly variable both in shape and duration and a large number of different action potential "types" have been described [7-11]. The action potential of visceral muscles greatly vary in their duration and they can be roughly divided into plateau and spike like types. These differ in duration from brief (40mS) spike to long (2-15 sec) plateau.

In this study smooth muscle of ileum is used and these cells are generally classified into Multiunit & single unit or visceral muscle. Visceral muscle are usually present in those organ that generate & propagate their own show rhythmic movement eg. Gut.

*Carum copticum* with herbarium number 293-0303-1 is a plant in Umbelliferae family with a white flower and small, brownish seeds. This plant is commonly grows in iran, India, Egypt and Europe. The major component of *Carum copticum* froth is essential oil which is composed of  $\gamma$ -terpinene, p-cymene,  $\alpha$ -pinene,  $\beta$ -pinene and other

substances such as thymol and carvacol. In the Iranian traditional medicine several therapeutic effects including expectorant, diuretic, anti-vomiting, analgesic, anti-asthma, anti-dyspnea and anti spasm, is postulated for *Carum copticum* froths [12]. The effective component(s) of this plant, responsible for the observed bronchodilatory effect [13], despite the availability of modern medications the propensity towards the traditional medications is growing throughout the world [14, 15] which needs scientific investigations for evaluating the therapeutic effects and their mechanisms of action.

## MATERIALS AND METHODS

**Experimental Protocol:** For experimental purpose male Albino Rats used under anaesthetization for the isolation of ileum as per standard ethical procedures. The pieces of isolated ileum used for mechanical recordings under oxygenated bathing medium (Tyrode's).

**Mechanical Recording:** The isolated organ bath and Oscillograph used for mechanical recording.

The mechanical recordings done through isotonic transducer on oscillograph.

An attempt made to analyze mechanical records obtained as control and under the influence of *Carum copticum* using interfacing with computer.

The obtained data analyzed as per standard statistical tools with a comparison between control and *Carum copticum* treatment using student's t Test at 0.05 level of significance.

**Isolation of *Carum copticum*:** Alcoholic extracts of *Carum copticum* obtained by boiling and collection of vapours on condensation using rotary apparatus.

**Chemicals and Reagents:** All chemicals and reagents used of analytical grade.

## RESULTS

The results showed clear relaxation and reduction in motility of ileum by acetyl choline response obtained in the presence of extracts which is compared with those responses obtained in the presence of saline and clear reduction in base line response obtained in the presence of extracts, in all five sets of experiments (Table 1).

The effective concentrations of acetyl choline  $10^{-4}$  causing 50% of maximum response (EC50) obtained in the presence of 0.01 extracts, in all five sets of experiments were significantly higher than those of base line (Table 2).

Table 1: Comparison of mean base line motility in the presence of *Carum copticum* extract

Baseline (mm)	<i>Carum copticum</i>	
M±SD	M±SD	P.V
4.28 ± 1.11	3 ± 0.57	0.022

Table 2: Comparison of mean contraction slope from base line due to the effect of acetyl choline in the presence of *Carum copticum*

Baseline (mm)	<i>Carum copticum</i>	<i>A. choline</i>	
M±SD	M±SD	M±SD	P.V
4.28±1.11	3±0.57	7.57±0.78	0.000

Table 3: Effect of *Carum copticum* extract on ileum contraction in the presence of acetyl choline.

Baseline (millimeter)	<i>A. choline</i>	<i>Carum copticum</i>	
M±SD	M±SD	M±SD	P.V
4.28 ± 1.11	19.57 ± 4.6	3 ± 0.57	0.000

The maximum response to acetyl choline obtained and then in the presence of extract mean contraction slope from base line is evaluate (Table 3).

The effect of acetyl choline-response in the presence of extract showed more decreased in contraction as compared with absence of extract.

The results of this study indicated a competitive antagonism effect of *C. copticum* at acetyl choline receptors.

An anti-cholinergic property of the plant were also suggested

## DISCUSSION

The results showed clear relaxation and reduction in motility of ileum by acetyl choline response obtained in the presence of extracts which is compared with those responses obtained in the presence of saline. The ant cholinergic effect observed for *C. copticum* in our study might be a result of several different mechanisms. A possible mechanism responsible for this effect could be the inhibitory effect of this plant on cholinergic receptors. The inhibitory effect of the extracts of this plant were, therefore, examined on isolated ileum preparations in this study indicated a functional antagonism effect of *C. copticum* at cholinergic receptors of rat ileum.

By evaluating the intestinal motility of *C. copticum* at cholinergic receptors, the anti-histaminic effect of extracts and essential oil of this plant were also examined on ileum preparation. The parallel change in cholinergic - response curves, obtained in the presence of all extracts and essential oil, compared to that of saline and significant improvement of maximum response to acetyl

choline in this part of the study showed competitive antagonism effects of extracts and especially essential oil with significant difference in maximum response to acetyl choline compared to that of saline from *C. copticum* at cholinergic receptors,

In order to investigate whether the functional antagonism effect of *C. copticum* at intestinal motility seen in the first part of the study is may be due to muscarinic blocking effects, The results of this part of the study were fairly indicating that functional antagonism of *C. copticum* at cholinergic receptors is mainly due to the blocking effect of this plant on muscarinic receptors [16]. In fact, the existence of a-pinene in essential oil of this plant was demonstrated [17] which showed anti-cholinergic activity [18]. Therefore, the change in cholinergic response curves obtained could be due to the presence of a-pinene or essential oil of this plant with a muscarinic receptor blocking effect.

However, in the presence of essential oil, only in group 1 experiments cholinergic-response curves could be obtained. The maximum response to cholinergic obtained in the presence of ethanol extract. The EC<sub>50</sub> and maximum response to acetyl choline obtained in the presence of extracts and essential oil from *C. copticum* in all experimental conditions indicated that effective substance(s) is higher in ethanol extract and essential oil.

The other possible mechanisms responsible for the smooth muscle relaxation effect of *C. copticum* and functional antagonism of ethanol extracts at cholinergic receptors are because of other possible mechanisms including calcium antagonism, opening of potassium channels and inhibition of phosphodiesterase [19-21]. In addition the ant cholinergic effect of *Carum copticum* may be due to its main constituent, carvacrol [17]. the relaxant effect of *Carum copticum* is also mainly due to carvacrol and that has a potent relaxant effect on ileum smooth muscle.

The contribution of these mechanisms in the smooth muscle relaxation effect of *C. copticum* and functional antagonism of ethanol extracts at cholinergic receptors should be clarified in further studies.

In conclusion, the results of this study showed *C. copticum* has a Relaxant effect on intestinal motility.

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