Research Article

Anti-Inflammatory Activity of *Coriandrum sativum* using HRBC Membrane Stabilizing Method

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ABSTRACT

The aim of the study was to determine the anti-inflammatory of activity *Coriandrum sativum* using HRBC membrane stabilizing method. Coriander is a highly reputed medicinal herb used in digestive, urinary and respiratory disorders. It is used to treat local swelling and pain, headache, conjunctivitis, bleeding disorders and cough. Linalool and Linalyl acetate present are potential anti-inflammatory agents. Inflammation is the body's attempt to heal itself after an injury, defend against foreign invaders and repair damaged tissues, showing signs of swelling, pain. Coriander extract was prepared using pure coriander seed powder mixed with Dichloromethane as a solvent and kept for 24 hours. Hypo tonicity induced human red blood cell (HRBC) membrane stabilization method was performed. It was observed that Coriander extract exhibited membrane stabilization effect by inhibiting hypo tonicity induced lysis of erythrocyte membrane. But the positive control Diclofenac has more efficient anti-inflammatory effect than the coriander. Since it's a synthetic drug, it has side effects. Instead, coriander can be combined with other natural drugs and used effectively for the future use in pharmacological arena.

Keywords: *Coriandrum sativum*, HRBC, Anti-inflammatory, Hypo tonicity, Diclofenac, Lysis.

INTRODUCTION

Coriander (*Coriander sativum*) belonging to family Umbelliferae, is a highly reputed medicinal herb originated from the Mediterranean and is now cultivated all over India, Italy, Netherlands, Central and Eastern Europe, China and Bangladesh.[1] It is native to regions from Southern Europe and Northern Africa to Southwestern Asia.[2] It is used in the disorders of digestive, respiratory and urinary systems, as it has diaphoretic, diuretic, carminative, stimulant and anti-inflammatory activity. It has been indicated for a number of medical problems such as dyspeptic complaints, loss of appetite, convulsion and insomnia.[3] It is also used to treat local swelling and pain, headache, burning sensation, lymphadenopathy, stomatitis, conjunctivitis, memory loss, digestive and bleeding disorders, cough etc.[4-6] All the parts of the plant are edible. The dried fruits or seeds are used as a spice since it gives a lemony citrus flavor. This is because of the terpenes, Linalool and Pinene. It is also used as a raw material for the preparation of essential oils.[7] It is used in the treatment of skin inflammation. Cineole and linoleic acids present in coriander possess antirheumatic and antiarthritic properties which reduce skin inflammation caused due to kidney malfunction or anaemia.[8] This plant has high economic value, with important constituents being the essential oil and fatty oils. The essential oil content is 1% and major component is Linalool.[9]

Linalool and Linalyl acetate present in coriander are potential `anti-inflammatory agents.[10] Coriander has multiple pharmacological effects including anti-inflammatory, anti-oxidant, analgesic and antispasmodic.[11] Inflammation is the body's attempt to heal itself after an injury, defend itself against foreign invaders and repair damage tissue characterized by redness, swelling, warmth, pain and some immobility.[12, 13] Anti-inflammatory drugs reduce swelling or the inflammation. An anti-inflammatory diet will include few inflammation causing prostaglandins (PGE2) and more of anti-inflammatory prostaglandins (PGE1 and PGE3).[8] The anti-inflammatory activity of coriander is compared with the positive control which is synthetic drug Diclofenac using Human Red Blood Cell (HRBC) Stabilization method.

MATERIALS AND METHODS

Preparation of the extract

The seeds of fresh coriander were finely powdered. 50g of this pure powder was mixed with 100ml of solvent Dichloromethane (CH_2Cl_2). The prepared extract was covered and preserved at room temperature for 24 hours.

The extract was filtered and the supernatant was strongly heated to let the volatile solvent to evaporate, thus leaving behind the semi-solid coriander extract for further procedures.

Isolation of Red Blood Cells for Membrane Stabilization Assay

Blood from a healthy donor who has not taken any NSAIDS for 2 weeks prior to the experiment was collected and centrifuged at 3000 rpm. The serum (supernatant) was removed and the other part was used. The packed cells were washed with sterile saline solution (0.9% w/v NaCl) and centrifuged again for 5 minutes. The procedure

was repeated three times and the supernatant formed was clear and colorless. This was reconstituted to 40% suspension (v/v) with PBS buffer (0.2 M, pH 7.4) and was used in the assay.

Hypotonicity induced Human Red Blood Cell (HRBC) Membrane Stabilization Method

1 mL of sample extract of different concentrations (200, 400, 600, 800, 1000 µg) with 1 ml of 0.2M PBS buffer ,0.5 ml of 0.25 % hyposaline and 0.5 mL of 10% HRBC suspension was added and incubated at 37^{0}C for 30 min. The tubes were centrifuged at 3,000 rpm for 20 min and the haemoglobin content of the supernatant solution was estimated spectrophotometrically at 560 nm. Diclofenac was used as standard and a control was prepared by distilled water instead of hypo saline to produce 100 % hemolysis without samples. The percentage of HRBC hemolysis and membrane stabilization or protection was calculated by using the following formula:

$$\% \text{ of Haemolysis} = \frac{\text{Optical Density of sample extract}}{\text{Optical Density of control}} \times 100$$

$$\% \text{ of Protection} = 1 - \left[\frac{\text{Optical Density of sample extract}}{\text{Optical Density of control}} \times 100\right]$$

RESULTS AND DISCUSSION

The following were the results obtained in experiment performed:

Haemolytic activity

Table 1: Shows the Haemolytic Activity % of the sample and positive control (Diclofenac)

Concentration of Sample (µg)	Sample Extract (%)	PC (%)
200	59.35	16.67
400	52.52	14.99
600	41.51	12.10
800	37.41	8.82
1000	36.61	4.49

The coriander extract exhibited membrane stabilization effect by inhibiting hypo tonicity induced lysis of erythrocyte membrane. The lysosomal membrane is similar to the erythrocyte membrane .Therefore the stabilization of this implies that extract may as well stabilize lysosomal membranes. The main aim is to reduce the inflammatory response by preventing the release of lysosomal constituents of activated neutrophil such as bactericidal enzymes and proteases, which cause tissue inflammation and damage extracellular release. This is due to osmotic loss of intracellular electrolyte and fluid components.

The sample is compared with positive control Diclofenac to check and compare the hemolytic and protection activity. As its seen from Table-1, in 200µg of concentration of extract, sample shows 59.35% haemolysis whereas the positive control is only 16.67%. Further, when the concentration of the extract increases, the haemolysis percentage decreases. When the concentration was 1000µg, the sample showed 36.61%, while PC was 4.49 % haemolysis. Therefore, we see that the positive control is efficient, exhibiting stabilization effect more than the coriander extract, thus less haemolysis will occur leading to an increased effect of anti-inflammation.

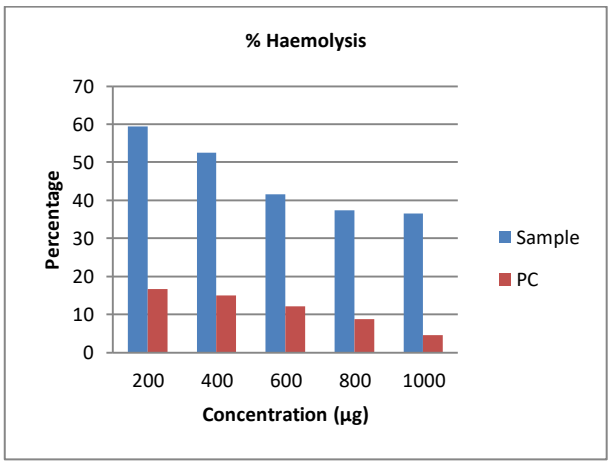

Figure 1: Shows the percentages of Haemolytic activities of the sample and positive control (Diclofenac)

Protective Activity

Table 2: Shows the Protection activity % of sample and positive control (Diclofenac)

Concentration of sample (µg)	Sample extract (%)	PC (%)
200	40.65	83.33
400	47.48	85.01
600	58.49	87.90
800	62.59	91.18
1000	63.39	95.51

The sample is compared with a positive control in order to check the percentage of protection of HRBC cells. As seen from Table-2, when the minimal concentration is 200 µg, the protection % for the sample and the positive control is 40.65%and 83.33% respectively. As the concentration is increased, the percentage of protection also increases. When the concentration is 1000 µg,

63.39% and 95.51% are the protection values, i.e., the positive control shows a higher protection activity than the sample.

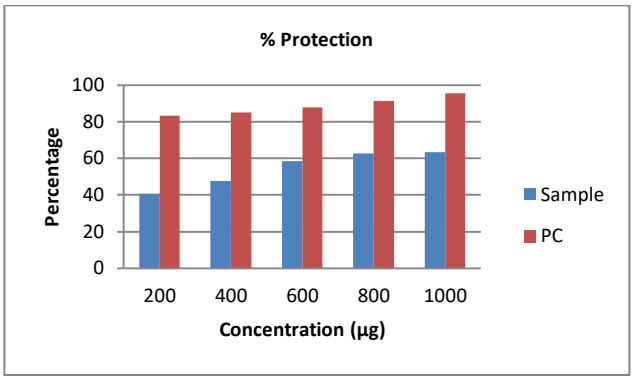

Figure 2: Shows the Protection activity percentages of sample and positive control (Diclofenac)

CONCLUSION

Inflammation is the body's biological response to harmful stimuli, to defend against foreign invaders and repair damaged tissues. They show signs of redness, swelling, pain and heat. The inflammation can be acute or chronic. Acute Inflammation is the initial response leading to increased movement of plasma and leukocytes from blood to injured tissues. Prolonged inflammation leading to a shift in the type of cells present at the site of inflammation characterized by destruction is Chronic Inflammation. In order to decrease the inflammation, the anti-inflammatory drugs come into play.

Coriander possesses nutritional and medicinal properties used to cure cold, nausea, stomach disorders, rheumatism and pain in the joints. Its properties are attributed to its exceptional phytonutrients as storehouse of bioactive compounds. It mainly consists of linalool (50-60 %) and terpenes (20%), linalyl acetate which are anti-inflammatory agents.

In the above results obtained, we conclude that the positive control Diclofenac has more efficient anti-inflammatory effect than compared to coriander. The disadvantage of this synthetic drug is that it has a lot of side effects like sneezing, wheezing, shortness of breath, rapid weight gain, stomach bleeding, liver and kidney problems, severe skin reactions, indigestion, increased blood pressure etc.

But when a natural drug like coriander is used in combination with many other natural drugs, it won't lead to side effects. Further laboratory studies and chemical isolation of this plant will confirm it to be an effective drug useful in the pharmaceutical arena.

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