

## ANTI-INFLAMMATORY ACTIVITY OF CURCUMIN AND CAPSAICIN AUGMENTED IN COMBINATION

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### ABSTRACT

**Objective:** Dietary curcumin and capsaicin are well known for their health beneficial properties. The current study was done to assess the anti-inflammatory activity of curcumin, capsaicin and their combination by employing *in vitro* and *in vivo* models.

**Methods:** We investigated the protective effect of curcumin, capsaicin and their combination using *in vitro* heat induced human red blood cell (HRBC) membrane stabilization, *in vivo* 2% agar induced leukocyte mobilization and acetic acid induced vascular permeability assay.

**Results:** Curcumin, capsaicin and their combination exhibited concentration dependent protective effect against heat-induced HRBC membrane destabilization, while combined curcumin and capsaicin retained (87.04±0.64 %) membrane stability and it is found to be better than curcumin, capsaicin and standard dexamethasone (75.0±0.25, 72±0.9 and 80.0±0.31 %) protective effect. In agar suspension induced leukocyte mobilization assay, the combined curcumin and capsaicin had shown 19.5±1.58 % of inhibition compared to individual curcumin and capsaicin, which showed moderate inhibition of 16.0±1.14 and 21.6±2.17 % respectively. Besides, the combined curcumin and capsaicin had shown highly significant inhibition of acetic acid-induced vascular permeability in rats (42.0±1.14 %), whereas individual curcumin and capsaicin showed moderate inhibition of vascular permeability with 34.0±2.41 and 41.0±1.92 % respectively.

**Conclusion:** This study demonstrates the significant anti-inflammatory property of combined curcumin and capsaicin at half of the individual concentration of curcumin and capsaicin.

**Keywords:** Curcumin, Capsaicin, Leukocyte mobilization, Vascular permeability, Human red blood cell membrane

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### INTRODUCTION

Inflammation is a complex biological response of vascular tissues to harmful stimuli [1]. Upon contact with the stimuli, immune cells undergo activation and release inflammatory mediators such as vasoactive amines and kinins which to remodel the local vasculature. These mediators vasodilate and permeabilize the blood vessels causing exudation of blood plasma [2] results in enlarged and dilated blood vessels [3] thereby activation of leukocytes which play an important role in the development, propagation and maintenance of inflammation [4]. These leukocytes move towards the inflamed site or tissue to alert inflammatory response, it used to be the essential step of defence against pathogens [5]. At the site of inflammation immune cells abrogate further invasion and multiplication of pathogens by phagocytosis [4] causing the production of several inflammatory mediators, including cytokines, chemokines, degrading enzymes, free radical oxygen and nitrogen species, and matrix proteases amplifying the inflammatory response and injury to surrounding tissues leading to inflammatory related diseases [6-11].

Spices are nutraceuticals which have been used as the predominant class of food adjuncts to enhance the taste, colour and flavor of foods and beverages. Curcumin, the yellow color giving principle of turmeric (*Curcuma longa*) and Capsaicin, the principle pungent component of red pepper (*Capiscum annuum*) are naturally occurring active principles. Clinical pharmacological studies on dietary curcumin and capsaicin have been proven to possess promising health beneficial therapeutic potential such as anti-arthritis [12, 13], anti-inflammatory [14, 15], antitumor and anticancer [16-18], anti-hyperglycemic [19] and lipid-lowering activities [20]. Mechanisms of action, which is responsible for the health beneficial pharmacological activity of these two commonly used curcumin and capsaicin have been extensively studied and reported [21-25]. Although these two spice principles share a considerable amount of structural homology nevertheless possesses notable differences in

the mechanism of action. Hence, the protective effect of curcumin, capsaicin and their combination against copper/iron induced low-density lipoprotein (LDL) oxidation, the toxicity of iron to liver and carrageenan-induced inflammation in rats was evaluated. The combined curcumin and capsaicin was found to be more effective than individual molecules. In addition, these molecules also shown to have decreased higher level of cholesterol and triglycerides in hypercholesterolemia and hyperlipidemic rats [23, 26].

In view of the above properties, the present study was further aimed at emphasizing the anti-inflammatory influence of combined dietary curcumin and capsaicin *in vivo* and *in vitro* to verify, if any additive/synergistic property being exerted by them. Information on the protective effect of combined curcumin and capsaicin as anti-inflammatory agents would be more relevant in the context of the dietary source being used extensively in combination by the people around the world.

### MATERIALS AND METHODS

#### Chemicals

Dietary curcumin and capsaicin were procured from Sigma-Aldrich. Acetone was procured from GeNee™ Bangalore, India. EDTA, Dextrose sodium, Wright's stain, Evans blue, acetic acid solutions were procured from Himedia. All other chemicals used were of analytical grade.

#### Animals

Male Wistar rats weighing 150-200 g were housed in individual stainless steel cages, maintained on standard pellet diet with *ad libitum* water. The animals were maintained under controlled conditions of temperature with 12 h light-dark cycle. The animals were used after an acclimatization period of three days in the laboratory animal house. Animal experiments were carried out

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