

Immunomodulatory activity of *Carcum copticum* leaf extracts

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(Received: April 04, 2010; Accepted: May 29, 2010)

ABSTRACT

Immunomodulatory activity of *Carcum copticum* i.e. ajwain plant was investigated by observing phagocytic index against *Candida albicans*. Soxhlet leaf extracts of the plant was found to be immunostimulant in nature.

Key words: *Carcum copticum*, Immunomodulation, Phagocytosis, *Candida albicans*

INTRODUCTION

Immunomodulation is interpreted as temporary alert in certain parts of the immune system¹. It is the change in the body's immune system caused by the agents that activate or suppress its function. So an immunomodulator is a substance that regulates the immune system. In spite of the availability of number of chemically synthesized immunomodulatory drugs in the market, side effects and high cost of therapy have limited their use. Hence there is an urgent need to look for alternative sources of effective, safe yet cheaper immunomodulatory agents.

The use of medicinal plants to cure human illness has been practiced from time immemorial. Plant products can serve as immunomodulators so immunomodulatory potential of medicinal plants needs to be evaluated. *Carcum copticum* commonly called as ajwain plant (family Umbelliferae) is an erect annual herb commonly found in south-west Asian countries. This plant is known to have medicinal properties and is used for in-digestion, gas relief and in toothache, earache and rheumatism. In view of this, an attempt was made in the present study to evaluate the immunomodulatory potential of *Carcum copticum*

MATERIAL AND METHODS

Mature healthy leaves of *Carcum copticum* were collected from Maharashtra Nature Park, Dharavi and brought to the laboratory. Leaves were washed, dried in an oven, powdered and subjected to preparation of hot extracts using soxhlet apparatus using three different solvents viz. chloroform, petroleum ether and methanol.

Determination of Immunomodulation through Phagocytosis

Stock solutions were prepared by dissolution fractions in dimethylsulfoxide (DMSO) according to the concentration required. The following concentrations were prepared by carrying out dilutions in HBSS (Hank's Balanced Salt Solution):- 1000µg, 500µg, 250µg.

Candida albicans was incubated in sabroud's broth overnight & then centrifuged to form a cell button which was washed with sterile HBSS for 4-5 times. The final cell button was mixed with sterile HBSS & human serum in a proportion of 4:1. The cell suspension of concentration of 1×10^6 was used for the experiment.

Human blood (0.2 ml) was obtained by finger prick method on a sterile glass slide. Slide in

triplicate were incubated at 37°C for 25 mins to allow clotting. The blood clot was removed & the slide was drained carefully with normal saline. Monolayer of PMN leucocytes was flooded with the predetermined concentration of test extracts for 15 mins at 37°C. The PMN were covered with *Candida albicans* suspension for 1hr. The slide was drained, fixed with methanol & stained with Giemsa stain.

The mean number of candida cells phagocytosed by PMN's on the slide was determined microscopically for 100 granulocytes using morphological criteria. This no. was taken as phagocytic index & was compared with the phagocytic index of the control.

Phagocytic index (PI) = total no. of *Candida* spores in 100 PMN cells / no. of PMN cells involved in phagocytosis

Phagocytosis % = no. of PMN cells containing ingested *Candida* spores out of 100 cells observed
Stimulation % = $\frac{\text{PI (test)} - \text{PI (control)}}{\text{PI (control)}} \times 100$

RESULTS AND DISCUSSION

The immunomodulatory activity of *Carcum copticum* leaf extracts was tested against *Candida* with respect to phagocytosis as phagocytosis is one of the most important host defence mechanism against invading microorganisms. The results indicated that immunomodulation was seen in all the three extracts i.e. petroleum ether, chloroform and methanol. Engulfment was seen in each test by each extract. The petroleum ether extract showed lesser activity than the other two extracts (Table 1-3). Immunostimulant activity was found to increase with increase in the concentrations of the plant extracts. The phagocytic index of the extract prepared using methanol was significantly higher compared to the other two solvents (Table 1).

Overall results of this study clearly indicate that *Carcum copticum* leaf extracts have immunomodulatory activity and they can be used as immunostimulant. Scientists have previously reported immunomodulatory activities from extracts

Table 1: Phagocytic index of soxhlet leaf extracts of *Carcum copticum*

| Concentration | Pet. ether | Chloroform | Methanol | Control |
|---------------|------------|------------|----------|---------|
| 250µg | 2.4 | 2.35 | 2.38 | 2.5 |
| 500µg | 2.47 | 2.87 | 2.87 | |
| 1000µg | 2.82 | 3.15 | 3.92 | |

Table 2: Phagocytic index of soxhlet leaf extracts of *Carcum copticum*

| Concentration | Pet. ether | Chloroform | Methanol | Control |
|---------------|------------|------------|----------|---------|
| 250µg | 83 | 84 | 85 | 76 |
| 500µg | 85 | 83 | 87 | |
| 1000µg | 89 | 85 | 91 | |

Table 3: Phagocytic index of soxhlet leaf extracts of *Carcum copticum*

| Concentration | Pet. ether | Chloroform | Methanol | Control |
|---------------|------------|------------|----------|---------|
| 250µg | 4.73 | 3.68 | 6.31 | 3.23 |
| 500µg | 10.53 | 25.24 | 26.83 | |
| 1000µg | 32.09 | 41.03 | 87.84 | |

of a number of plants. Immunomodulatory activities of plants can be categorized into immunostimulatory or immunosuppressive. The aqueous extract of roots of *Baliospermum montanum* exhibited significant effect on phagocytosis by human neutrophils and chemotactic locomotion of neutrophils². While

Carum copticum i.e. ajwain plant extracts were found to have immunostimulatory activity; other plants like *Urena lobata*, amla and shankhapushpi have previously exhibited immunosuppressive activities^{3,4}.

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