Preventive Effect of Nigella Sativa Essential Oil on Signs of Ocular Allergy Induced by Compound 48/80 in Rabbits

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ABSTRACT

Aim: To evaluate preventive anti allergic effect of Nigella sativa on signs of ocular allergy produced in rabbits by topical application of compound 48/80

Study design: Experimental study

Materials and methods: Twelve rabbits were divided into two groups. Signs of ocular allergy were induced by compound 48/80 and the effect was seen without and with pretreatment with essential oil of Nigella sativa.

Results: the findings of present study show that oral pretreatment with Nigella sativa essential oil attenuates the ocular allergic response in rabbits that is produced by compound 48/80.

Conclusion: Our findings suggest that Nigella sativa essential oil has mast cells stabilizing property.

Key words: Nigella sativa, compound 48/80, ocular allergy

INTRODUCTION

An important undesirable side effect of immunity is the development, under some conditions, of allergy or other types of immune hypersensitivity. Hypersensitivity can be classified as antibody-mediated or cell mediated (Type I-IV). Type I-III is antibody mediated while type IV is cell mediated. In general, immediate-type hypersensitivity reactions involve asthma, allergic rhinitis, conjunctivitis, urticaria, and anaphylaxis. Immediate or type I hypersensitivity is IgE mediated, with symptoms usually occurring within minutes following the patients encounter with antigens. A severe type I hypersensitivity reaction such as systemic anaphylaxis requires immediate medical intervention. Signs and symptoms of ocular allergy are itching, injection, chemosis and mucous discharge.

Mast cells are the primary effector cells involved in an allergic or immediate hypersensitivity response Activation of mast cells occurs in response to a challenge by a specific antigen against which the surface immunoglobulin E is directed, or by other IgE directed ligands. Activated mast cells can produce histamine, as well as a wide variety of other inflammatory mediators such as eicosanoids, proteoglycans, proteases, and several pro-inflammatory and chemotactic cytokines. Mast cell degranulation can also be elicited by the basic secretagogues. The most potent secretagogue include the compound 48/80, which is mixed polymer of phenethylamine cross linked by formaldehyde and a high dose of which induces almost a 90% release of histamine from mast cells.

Nigella sativa also known as black seed has long been used in traditional medicine, in conditions related to the respiratory and gastrointestinal system as well as a natural remedy for various allergies. The oil and seed constituents, in particular thymoquinone have shown promising medicinal properties in the treatment and prevention of a wide range of diseases. Regarding treatment of allergies there is an increasing interest toward the potential health benefits of medicinal plants.

MATERIALS AND METHODS

Animals: Adult rabbits of either sex weighing 1–1.5 Kg were purchased from local market and kept in the animal house of PGMI for one week for acclimatization. They were fed on grass and grain; tap water was provided ad libitum.

Preparation of Nigella sativa essential oil: Fresh seed of Nigella sativa were purchased from local market. They were ground and subjected to hydrodistillation using reverse Dean – Stark apparatus for 6 hours in PCSIR laboratories, Lahore. The extracted essential oil was dried over anhydrous sodium sulphate and stored at 4°C for use. Yield of essential oil was 0.4% which is in accordance with international standard. Essential oil was dissolved in alcohol and diluted with distilled water before administration.

Induction and prevention of signs of ocular allergy: Twelve rabbits were divided into two groups, each group containing six rabbits. Signs of ocular allergy were induced by topical application of compound 48/80 (Sigma) which is mast cell degranulation agent. In rabbits of group I (n=6) right
RESULTS

Signs of ocular allergy started appearing immediately after application of compound 48/80. Lacrimation and irritation were maximum at 10 minutes and then decreased. Congestion was maximum at 10 minutes and was sustained up to 30 minutes. Chemosis became maximum at 20 minutes and was sustained up to 30 minutes. Cumulative score was maximum at 10 minutes and this was used for statistical analysis.

Table 1 shows cumulative allergy score without and with *Nigella sativa* pretreatment. Without *Nigella sativa* mean score was highly significant as compared to control with p value <0.001. With pretreatment with essential oil of *Nigella sativa*, compound 48/80 produced signs of ocular allergy but of lesser magnitude. Mean score was significantly high with p value of < 0.005. When allergy score of experimental eyes without and with *Nigella sativa* were compared, results were again significant with p value <0.01. This shows that pretreatment with *nigella sativa* essential oil significantly reduced manifestation of allergic response to compound 48/80 although not able to abolish completely.

Table 1: Cumulative ocular allergy score without and with *nigella sativa* essential oil pretreatment

<table>
<thead>
<tr>
<th>S. No</th>
<th>Without Nigella sativa</th>
<th>With Nigella sativa</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C1</td>
<td>EI</td>
<td>CII</td>
</tr>
<tr>
<td>1.</td>
<td>1</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>2</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>1</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>2</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>1</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Mean±SD</td>
<td>1.3±0.51</td>
<td>11.3±1.50</td>
<td>1.5±0.54</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Ocular allergy is often encountered by allergists, ophthalmologists and primary care physicians. Search for new pharmacological agents will improve the efficacy and safety of ocular allergy treatment. In the current study preventive effect of *Nigella sativa* essential oil was observed on the signs of ocular allergy induced by compound 48/80.

Signs of ocular allergy started appearing immediately after topical application of compound 48/80 in the current study. These were lacrimation, irritation, congestion and chemosis. Conjunctival mast cells are important effector cells in seasonal allergic conjunctivitis via histamine and cytokine secretion. It is well recognized that Compound 48/80 can induce a mast cell dependent non specific anaphylactic reaction. Compound 48/80 is known to activate mast cell secretory processes by increasing the rate of
guanisine triphosphate gamma S binding to G proteins\textsuperscript{12} which trigger activation of protein kinase C and Ca\textsuperscript{2+} signaling which results in the release of histamine from these cells\textsuperscript{13} by inducing the movement of granules to the plasma membrane followed by degranulation of mast cells and basophils\textsuperscript{14}. Many studies have been conducted to find out the effect of various substances on histamine release from mast cells. \textit{Nigella sativa} is one of such herb that is thought to have anti allergic effect.

The seeds of \textit{Nigella sativa} commonly known as black seed or black cumin are used in folk (herbal) medicine all over the world for the treatment and prevention of a number of diseases and conditions that include asthma, diarrhea, dyslipidemia, inflammation and bronchitis. They are also used in food as a spice and a condiment. The seeds contain both fixed and essential oils, proteins, alkaloids and saponins. Much of the biological activity of the seeds has been shown to be due to thymoquinone, the major component of essential oil, which is also present in the fixed oil\textsuperscript{15}. Many studies have been conducted on the effect of \textit{Nigella sativa} seed extracts or oils on various body systems in vivo and in vitro. The aqueous extract of \textit{Nigella sativa} has shown an anti inflammatory effect demonstrated by its inhibitory effects on carrageenan induced paw edema\textsuperscript{16}. Studies have shown its inhibitory effect on histamine release from mast cells. In an experiment carried out on rat peritoneal mast cells, in vitro, it has been shown that nigellone, a carbonyl polymer of thymoquinone isolated from \textit{Nigella sativa} seeds, was highly effective in inhibiting histamine release. The mechanism of action seems to be through decreasing intracellular calcium by inhibiting its uptake and stimulating its efflux, by an inhibition on protein kinase C. There is also indication for a mild inhibition of oxidative energy metabolism contributing to some inhibition of the release\textsuperscript{17}. The present study has shown that oral pretreatment with \textit{Nigella sativa} essential oil has reduced the severity of signs of ocular allergy. These results are in agreement with a study which showed that administration of thymoquinone suppressed the ocular symptoms and inflammatory cell infiltration in conjunctiva of mice\textsuperscript{18}. These findings suggest that \textit{Nigella sativa} essential oil has mast cells stabilizing property and prevents signs of ocular allergy induced by compound 48/80.

CONCLUSION

Considering these findings one can conclude that \textit{Nigella sativa} could be of therapeutic potential in preventing diseases associated with hypersensitivity.

REFERENCES
