Wound healing effect of *Azadirachta indica* and *Curcuma longa* in guinea pigs

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**Abstract:** *Azadirachta indica* and *Curcuma longa* is the most useful traditional plant being used in India for medicinal purposes from centuries. There is evidence that these plants have anti-inflammatory, analgesic, antipyretic, antioxidant and anticancer activities. Work has been done on the wound-healing and anti-inflammatory activities of these plants and investigation is needed to understand the mechanism of these effects for their better therapeutic utilization. This experiment was done on forty healthy ginea pigs dividing it in four groups, group A were treated with aqueous extract of *Azadirachta indica* plant leaves, group B by the fine powder of *Curcuma longa* root, group C Framycetin sulphate ointment and group D only with distilled water. Two wound of 6 cm length were made through the full thickness of the skin on the either side of the vertebral column under local anesthesia was created and treated by above mentioned drugs. Histomorphological study and time taken in wound healing was noted for different group animals. Statistical analysis of the data was done by applying unpaired t-test. Cellular infiltration, neovascularization, fibroblast proliferation, epithelialization and collagenization all were faster in wound healing by primary intention with aqueous extract of both *Azadirachta indica* leaves and fine powder of *Curcuma longa* rhizomes treated groups when it was compared with control. The process of healing was found faster with aqueous extract of *Azadirachta indica* leaves when it was compared with fine powder of *Curcuma longa* rhizomes.

**Keywords:** *Azadirachta indica, Curcuma longa, Wound-healing, Anti-inflammatory activities, Ginea pigs.*

**INTRODUCTION**

*Azadirachta indica* is an important medicinal plant. Its medicinal activity is known from ancient time. It has wide spectrum of biological activity. Every part of the plant is full of medicinal property and it is being used for the treatment of various diseases [1-6]. It is considered as general health promoter and has antioxidant property [7-8]. In folk medicine *Azadirachta indica* which is also known as ‘neem’ tree, its leaf is being used to control leprosy, intestinal helminthiasis, chronic syphilitic sores and respiratory disorder [9]. Neem tree oil is used to control skin infection [1]. It is also consider beneficial in itching, burning sensation and skin ulcer [10]. Lotion derived from neem leaf, when locally applied, can cure these dermatological diseases within 3–4 days.

Antipyretic analgesic and anti-inflammatory property is present in various extract of *Azadirachta indica* [11]. The chloroform extract of stem bark was effective in reducing paw edema in rat. It was also found effective in reducing mouse ear inflammation [12]. Neem oil has antipyretic activity [13-14]. Methanol extract of the leaves exerts antipyretic effect in male rabbits [15].

Leaves, seeds and bark possess a wide spectrum of antibacterial, antifungal and anti viral properties. It has action against Gram-negative and Gram-positive microorganisms. It is effective against M. tuberculosis, streptomycin resistant strains [16], Streptococcus mutans, S. faecalis, [17] Vibrio cholerae, Klebsiella pneumoniae, and M. pyogenes [18]. Neem leaf, neem oil and seed extract are effective against certain human fungi like Trichophyton, Epidermophyton, Microsporum, Trichosporon, Geotricum and Candida [19].

Turmeric is an anti-inflammatory agent [20] and used in bursitis, arthritis, back pain and reducing post-surgical inflammation [21]. Turmeric lowers the production of inflammation-inducing histamine. It increases and prolongs the action of the natural anti-inflammatory action of the body. It also improves circulation. Curcumin is its main active constituent. In an experiment it was found that curcumin inhibits neutrophil aggregation associated with inflammation and platelets aggregation [22-26]. It also inhibits biosynthesis of prostaglandins from arachidonic acid [27-29], and neutrophil function during inflammatory states which is related to its mechanism of anti-inflammatory effect.

It is useful in cancer prevention, liver protection and premature aging. Its hepatoprotective effect is mainly a result of its antioxidant properties, as
well as its ability to decrease the formation of pro-inflammatory cytokines.

Curcumin is an antioxidant. Its antioxidant properties are comparable to vitamins C and E. In a study it was seen that pretreatment decreased ischemia-induced changes in the heart. It also helps in reducing blood clumps.

Turmeric extract inhibit the growth of a variety of bacteria, parasites, and pathogenic fungi. In animal study topically applied turmeric oil inhibited dermatophytes and pathogenic fungi. A study of chicks demonstrated that diets supplemented with one percent turmeric resulted in a reduction in small intestinal lesion scores.

Very little work has been done on the wound-healing and anti-inflammatory activities of these plants and investigation is needed to understand these effects to be employed in meeting human needs.

MATERIALS AND METHODS

The experiment was done in the department of pharmacology of a tertiary care center after the permission of institutional ethics committee. Forty animals were housed individually in standard laboratory environment for 7 days, fed with commercial pellet diet and water ad libitum. The experiment was done on healthy male guinea pigs dividing it into four groups, each group containing 10 animals.

Group A were treated with aqueous extract of Azadirachta indica plant leaves, group B by the fine powder of Curcuma longa root, group C Framycetin sulphate ointment and group D only with Distilled water.

Study of physical parameter, wound index and histomorphological studies were done by the method described by Rafieq et al, Biswas et al and Culling. All the animal was examined to ensure its good clinical condition. Two wound of 6 cm length were made through the full thickness of the skin on the either side of the vertebral column under local anesthesia with full aseptic precaution in opposite thigh. Above mentioned drugs were applied topically once daily on different group after washing it with sterile water. Statistical analysis of the data was done by applying unpaired t-test. Study of shrinkage of wound size and histomorphological study was done by randomly selecting ten guinea pigs on same site.

The shrinkage of length of wound was measured every 3rd day to complete healing of all the wounds. The progressive decreases in wound area were monitored periodically by tracing the wound margin on a tracing paper and the length assessed using a paper graph.

The scoring system for wound index measurement was as follows- Complete healing of wounds provided score 0, Incomplete but healthy healing:1, delayed but healthy healing:2, healing has not started:3, Formation of pus and evidence of necrosis was provided score 4.

HISTOPHARMACOLOGICAL STUDIES

Table-1: Scoring system for the measurement of histomorphological parameters for assessment of wound healing

<table>
<thead>
<tr>
<th>Score</th>
<th>Cellular infiltration</th>
<th>Fibroplasia</th>
<th>Neovascularization</th>
<th>Epithelialization</th>
<th>Collagenization</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>1</td>
<td>0-5 cells/HPF</td>
<td>Small number of fibroblast towards surface extending down to deeper areas</td>
<td>1-5 new blood vessels/HPF</td>
<td>Up to 20% epithelialization</td>
<td>Small amount of thin collagen</td>
</tr>
<tr>
<td>2</td>
<td>3-60 cells/HPF</td>
<td>Diffuse fibroblastic proliferation towards surface extending down to deeper areas</td>
<td>6-10 new blood vessels/HPF</td>
<td>50% epithelialization</td>
<td>Between 1 and 3</td>
</tr>
<tr>
<td>3</td>
<td>More than 30 cells/HPF</td>
<td>Dense fibroblast proliferation over whole area and fibroblast laying down collagen fibers</td>
<td>11-15 or more blood vessels/HPF</td>
<td>80% epithelialization</td>
<td>Diffuse thick collagen</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Dense fibroblast proliferation over whole area and fibroblast laying down collagen fibers</td>
<td></td>
<td></td>
<td>Wavy collagen</td>
</tr>
</tbody>
</table>

RESULTS

Wound index at day 11 is significant of both the studied drugs in comparison to control but it is less effective than framycetin. Wound index of Azadirachta indica is less then Curcuma longa. Total days in wound healing were found 15th days with Azadirachta indica and 17th day with Curcuma longa. This period is less then control group but more then framycetin.
Azadiricta indica and Curcuma longa treated group cellular infiltration, neovascularization, fibroblast proliferation, epithelialization and collagenization all were found significant when it was compared with control group although in every study group factors affecting wound healing like size, location, type of wound, mechanical factors, and nutritional status is almost the same. Both these drugs have highly significant effect in wound healing.

**DISCUSSION**

The above data reveals that the process of healing is faster with Azadirichta indica at both 5th and 11th days. Wound index is significant with both the experimental drug but when these two drugs were compared together Azadirichta indica showed significant effect in comparison to Curcuma longa.

There is complete healing of the wound in 11th 15th 17th and in 22 days subsequently by Framycetin, Azadirichta indica, Curcuma longa and by control group. The process of healing was found faster with Azadirichta indica when it was compared with Curcuma longa.

A compound NB II peptidoglycan present in neem bark is an immunomodulator [35]. This immunomodulatory effect may have a crucial role both
in humoral and cell-mediated responses. All these factors explain why healing by *Azadirachta indica* is faster than control group.

*Curcuma longa* is an antioxidant and have free radical scavenging property. It enhances immunity. It increases and prolongs the action of body’s natural anti-inflammatory adrenal hormone and cortisol. It also improves circulation. In this study the score of *Curcuma longa* for neovascularization, fibroblast proliferation, epithelialization and collagenization are highly significantly (table: 2&3) in comparison to control group. This is probably due to above mentioned reason and its anti-inflammatory and antimicrobial (antiviral and antifungal) actions. It reduces the formation of blood clumps. It is hepatoprotective and helps in premature aging of the cell. These properties may also help in wound healing.

CONCLUSION

Cellular infiltration, neovascularization, fibroblast proliferation, epithelialization and collagenization all are faster in wound healing by primary intention with aqueous extract of both *Azadirachta indica* leaves and fine powder of *Curcuma longa* rhizomes treated groups. Both the drugs are effective in accelerating in wound healing; however *Azadirachta indica* was found more effective than *Curcuma longa*. There is need of more specific study to determine the efficacy of these drugs.

REFERENCES

24. Ukil, A., Maiti, S., Karmakar, S., Datta, N., Vedasiromoni, J. R., Das, P. K., (2003). Curcumin, the major component of food flavour turmeric,


