LITERATURE REVIEW

Literature review was carried out by referring to various national and international journals, official standard books and various websites on the internet.

1. Balekar et al (2012) evaluated the wound healing potential of ethanolic extract of Wedelia trilobata (L.) leaves. The ethanolic extract was subjected to column chromatography. Hexane, ethyl acetate and chloroform : methanol (50:50) fractions were tested for in vitro wound healing assays.

2. Murti et al. (2012) evaluated the wound healing activity of aqueous and ethanolic extracts of roots of Ficus racemosa L. in incision and excision wound models. The aqueous extract has better wound healing ability than ethanolic extract.

3. Hayouni et al (2011) evaluated the wound healing activity of 5% w/w methanolic extract based ointment of Pumica granatum L. peels in guinea pigs in dermal wound model. The ointment has significant wound healing potential. The extract also showed antibacterial, antifungal and antioxidant activities.


6. Kokane et al (2009) studied the wound healing activity of roots of Mimosa pudica by incorporating the methanolic and aqueous extract in simple ointment base B.P. in conc. of 0.5%, 1%, and 2% w/w in excision and incision wound models. At 2% conc. extracts had most significant activity. Tannins may have important role in wound healing process.
7. Kumar et al. (2007) have attempted to analyse the Ethnobotanical knowledge for the treatment of cuts and wounds which includes usage of plants and methods employed by tribal and folklore practices prevailing in India. This review therefore attempts to bridge the lacunae in the existing literature and offers immense scope for researchers engaged in validation of the traditional claims and development of safe and effective and globally acceptable herbal drugs for cuts and wounds.

8. Manjunatha et al. (2007) evaluated the wound healing potency of ethanolic leaf extracts of Vitex trifolia L. and Vitex altissima L. in incision, excision and dead space wound models. Both plants have significant wound healing activity but ethanol extract of Vitex trifolia L. showed maximum activity.

9. Nayak et al. (2007) evaluated the wound healing activity of ethanolic extract of flowers of Jasminum grandiflorum using excision and dead space wound models and found that the extract has more significant wound healing activity as compared to control. The LD$_{50}$ was found to be 2500mg/kg b.w.

10. Shivkumar et al. (2007), screened the wound healing activity of pet. ether, alcoholic and aqueous extracts of Thespesia populnea in excision and incision wound models. The aqueous extract has more significant wound healing activity that may be due to the presence of flavanoids, alkaloids and phytosterols.

11. Chaudhari et al. (2006) analysed the wound healing effect of phytoconstituents fractionated from a hydroalcoholic extract of bark of the plant of Terminalia arjuna on topical application in excision and incision wound models. The fraction I has maximum wound healing activity.

12. Lodhi et al.(2006), evaluated wound healing potential of Tephrosia purpurea (Linn.) Pers in rats. The result showed that ethanolic extract in the form of ointment (5%w/w) has significant wound healing activity in incision, excision and dead space wound models.

13. Mandawgade et al. (2006) analysed the wound healing potential of different extracts and lawsone isolated from leaves of Lawsonia alba by topical and oral route of
administration. Extracts and lawsone showed significant wound healing activity by oral and topical application, but topical application of ethanol extract shows better wound healing activity than the other extracts.

14. Udupa et al. (2006), analysed the effect of ethanolic extract of leaves of *Ocimum sanctum* on normal and dexamethasone suppressed wound healing using excision, incision and dead space wound models in albino rats. The extract promotes the wound healing significantly and able to overcome the wound healing suppressing action of dexamethasone.


16. Jalalpure et al. (2002) analysed the wound healing activity of crude aqueous extract from galls of *Ouercus infectoria* Olivier. Three different crude fractions were subjected for various preliminary phytoconstituents and also screened for wound healing potential by incision, excision and dead space wound models in albino rats. Tannins, flavanoids, steroids and carbohydrates were present in aqueous extract and its various fractions. The aqueous extract and its fractions have significant wound healing activity and flavanoids may be responsible for this.

17. Jaswanth et al. (2001) evaluated the wound healing activity of methanolic extract of *Aegle marmelos* in excision and incision wound model by topical and intraperitoneal administration. Both the injection and ointment of methanol extract produced a significant wound healing in both wound models.

18. Saha et al (1997), evaluated wound healing activity of methanolic extract of *Leucas lavandulaefolia* both in the form of ointment and injection in incision and excision wound models. Both formulations in excision and incision wound models showed significant wound healing activity.
19. **Agarkar et al (1999)** reviewed the phytochemical and pharmacological investigation of genus *Cassia* in which he described various species of *Cassia* their phytoconstituents and uses.

20. **Joshi et al (1993)** studied and evaluated the marginal trichom which is a diagnostic character in the identification of some medicinal closely related species of genus *Cassia* Linn.

21. **Danish et al (2011)** reviewed the phytochemical and pharmacological aspects of *C. fistula* and reported that it possess hepatoprotective, anti-inflammatory, antitussive, antifungal and wound healing activities. It is a rich source of tannins, flavones and glycosides.

22. **Gobianand et al. (2010)**, evaluated Anti-inflammatory and Antipyretic actions of *Cassia fistula* Linn. (Golden Shower) in Wistar Albino Rats. Inflammation was induced using carrgeenan (rat paw oedema) and cotton pellet granuloma models while pyrexia induced using TAB Vaccine. Extract showed analgesic and antipyretic effect in dose dependent manner.

23. **Siddhuraju et al. (2002)**, evaluated antioxidant activity of 90% ethanol extract of leaves and 90% methanol extract of stem bark, pulp and flowers from Indian laburnum (*C. Fistula* L.). The antioxidant activity was maximum in stem bark minimum in flowers and pulp.

24. **Duraipandiyan et al. (2002)** evaluated antibacterial and antifungal activity of hexane, chloroform, ethylacetate, methanol and water extract from flowers of *C. Fistula*. All extracts exhibit antibacterial activity against Gram +ve organisms with MIC between 0.078 and 2.5mg/ml and only against one Gram-ve bacteria (Pseudomonas aeroginosa).

25. **Bhakta et al (1998)** evaluated the hypoglycaemic activity of methanolic extract of *C. Fistula* Linn. Leaves in alloxane induced diabetic rats. LD$_{50}$ was found to be 3.5 g/kg. The methanolic extract possessed significant hypoglycaemic activity at dose of 200, 400, 600mg/kg and maximum with 600mg/kg at the end of 10$^{th}$ hour.
26. **Bhakta et al (1998)** evaluated in vivo wound healing activity of methanolic extract of leaves in the form of ointment at conc. of 5%, 10% w/w in simple ointment base. The ointments show significant wound healing activity in both models.

27. **Singh et al (1992)** analysed the aqueous extract of *Cassia fistula* flowers in female reproductive organs of albino rats and found that the extract at dose of 100 and 200 mg/k/day/rat for 15 days showed evidence of follicular atresia with absence of corpus luteum at high dose.

28. **Sini et al (2011)** evaluated the ethanol and water extract of *Cassia occidentalis* leaves for analgesic activity using acetic acid induced writhing test and tail immersion test in mice and antipyretic activity using yeast induced pyrexia method in rats. Both the extracts showed significant analgesic and antipyretic effect.

29. **Verma et al. (2010)** analysed the antidiabetic activity of ethanolic extract of *C. occidentalis* in normal and alloxan-induced diabetic rats. The extract exhibited significant antidiabetic activity and also resulted in improvement in parameters like body weight and lipid profile as well as regeneration of β-cells of pancreas and so it might be of value in the treatment of diabetes.

30. **Jadav et al (2010)** reviewed on *C. occidentalis* which is used to cure various diseases in traditional medicine. It possess antibacterial, antifungal, antidiabetic, anticancer, antimitogenic and hepatoprotective activity. Wide range of chemical constituents including achrosin, aloemodine, emodine, anthraquinone, chrysophanol etc. have been isolated.

31. **Sheeba et al (2009)**, evaluated the wound healing activity of methanolic crude extract of *Cassia occidentalis* leaves and chrysophanol isolated from the extract in albino rats using excision, incision and dead space wound models. Chrysophanol was found to possess most significant wound healing property than methanol crude extract.

32. **Jafri et al, (1999)** analysed the hepatoprotective activity of aqueous-ethanolic (50%w/w) extract of *C. occidentalis* leaves on rat liver damage induced by paracetamol and ethyl alcohol by monitoring serum transaminases, alkaline
phosphatase, serum cholesterol, serum total proteins and histopathological alterations. The extract of leaves of plant produced significant hepatoprotection.

33. Singhal et al (2012) evaluated the antipsoriatic activity of cream formulated from methanolic extract of *Cassia tora* Linn. by using ultraviolet –B induced psoriasis in rat.

34. Pawar et al (2011) presented the overview of *Cassia tora* Linn. The review on pharmacognosy, phytochemistry and biopotential of *Cassia tora* may provide strong evidence for its use in different medicines.

35. Sharma et al. (2010) analysed the antibacterial activity of ethanolic and aqueous extract from *Cassia tora* Leaves. Both the extracts exhibited significant antibacterial activity.

36. Rejiya et al (2009) analysed the *Cassia tora* methanolic extract of leaves in cancer therapeutic and found it was significantly effective.

37. Patil et al. (2004), evaluated the hypolipidemic effect of Ethanolic extract of seeds of *Cassia tora* L. and its fractions on triton induced hyperlipedemic profile. Ethanolic extract and its fractions decreased serum level of total cholesterol, increased in serum HDL-cholesterol, decreased triglyceride level and reduction in LDL-cholesterol level.
## PLANTS WITH WOUND HEALING ACTIVITY

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Plant</th>
<th>Part /Extract used</th>
<th>Model used/dose</th>
<th>Result/Inference</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Adhatoda vasica</em></td>
<td>Leaves/ Methanol, chloroform, diethyl ether</td>
<td>Excision</td>
<td>Significant healing activity comparable to standard (nitrofurazone ointment)</td>
<td>Vinothapooshan et al</td>
</tr>
<tr>
<td>2.</td>
<td><em>Allium cepa</em></td>
<td>Bulbs/ Chloroform Alcohol</td>
<td>Excision Incision Dead Space/300mg/kg</td>
<td>Enhanced activity due to free radical scavenging activity of plant</td>
<td>Shenoy et al</td>
</tr>
<tr>
<td>3.</td>
<td><em>Buddleja globosa</em></td>
<td>Leaves/ Aqueous, Ethanol</td>
<td>Excision</td>
<td>Accelerate activity due to flavanoids</td>
<td>Mensah et al</td>
</tr>
<tr>
<td>4.</td>
<td><em>Calotropis procera</em></td>
<td>Latex</td>
<td>Excision Dead Space/20µl of 1% sterile solution</td>
<td>Traditional use in the management of wound healing</td>
<td>Rasik et al</td>
</tr>
<tr>
<td>5.</td>
<td><em>Datura alba</em></td>
<td>Leaves/ Alcohol</td>
<td>Excision Dead Space/10% w/w ointment</td>
<td>Justifies the traditional use in wound management</td>
<td>Shanmuga et al</td>
</tr>
<tr>
<td>6.</td>
<td><em>Glycyrrhiza glabra</em></td>
<td>Roots/ Oil</td>
<td>Excision</td>
<td>Effective herbal remedy in wound healing</td>
<td>Oloumi et al</td>
</tr>
<tr>
<td>7.</td>
<td><em>Jasminum grandiflorum</em></td>
<td>Flower/ Ethanol</td>
<td>Excision Incision Dead Space/250mg/kg b.w.t</td>
<td>Healing activity suggests its use in the management of wound healing</td>
<td>Nayak et al</td>
</tr>
</tbody>
</table>
## WOUND HEALING MODELS

<table>
<thead>
<tr>
<th>Wound model</th>
<th>Drug treatment</th>
<th>Parameter monitored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incision wound (for collagenation phase). (Lodhi et al 2006).</td>
<td>From 0 to 9\textsuperscript{th} post-wounding day</td>
<td>Breaking strength</td>
</tr>
<tr>
<td>Excision wound (for the wound contraction, epithelialization and scar size) in normal rats. (Singh et al 2009)</td>
<td>From 0 to 21\textsuperscript{st} post-wounding day</td>
<td>From 0 to 21\textsuperscript{st} post-wounding day</td>
</tr>
<tr>
<td>Dead space wound in normal rats (Singh et al. 2009).</td>
<td>From 0 to 9\textsuperscript{th} post-wounding day</td>
<td>Granulation breaking strength, dry granulation weight, hydroxyproline estimation and antioxidation studies in the granulation tissue.</td>
</tr>
</tbody>
</table>